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ENVIRONMENTAL ASSESSMENT

USDA Forest Service Cooperative Gypsy Moth Suppression Projects - 1985

Lead Agency: USDA Forest Service
Northeastern Area State and Private Forestry

Cooperating Agencies:

- Delaware Department of Agriculture
Division of Production and Promotion
- Maryland Department of Agriculture
Office of Plant Industries and Pest Management
- New Jersey Department of Agriculture
Division of Plant Industry
- New Jersey Department of Environmental Protection
Bureau of Forest Management
- Pennsylvania Department of Environmental Resources
Bureau of Forestry
- Rhode Island Department of Environmental Management
Division of Forest Environment
- West Virginia Department of Agriculture
Plant Pest Control Division

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USDA FOREST SERVICE

Northeastern Area, State and Private Forestry

DECISION NOTICE AND FINDING OF NO SIGNIFICANT IMPACT

Gypsy Moth Suppression Projects - 1985

This Environmental Assessment (EA) was prepared to document the site-specific environmental analysis conducted by the USDA Forest Service and State agencies requesting Federal assistance for 1985 cooperative gypsy moth suppression projects. This EA discusses the purpose and need for action in 1985, treatment areas, insecticides, application methods, public involvement notification procedures, monitoring and associated environmental effects.

Cooperative suppression projects are proposed in:

Delaware - 53,000 acres in the counties of New Castle and Kent, treatment with Bacillus thuringiensis;

Maryland - 120,000 acres in the counties of Allegany, Garrett, Anne Arundel, Baltimore, Caroline, Carroll, Cecil, Frederick, Harford, Howard, Kent, Montgomery, Prince Georges, Queen Annes, and Washington, and the city of Baltimore, treatment with carbaryl, diflubenzuron, and Bacillus thuringiensis;

New Jersey, Department of Agriculture - 46,000 acres in the counties of Atlantic, Bergen, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Middlesex, Monmouth, Morris, Ocean, and Salem, treatment with Bacillus thuringiensis;

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New Jersey, Department of Environmental Protection - 6,000 acres in 8 State forests and parks in the counties of Burlington, Monmouth, Salem, Ocean, Cape May, Bergen, and Passaic, treatment with Bacillus thuringiensis;

Pennsylvania - 212,000 acres in the counties of Adams, Bedford, Blair, Cambria, Centre, Clarion, Clinton, Cumberland, Dauphin, Elk, Forest, Franklin, Fulton, Huntingdon, Jefferson, Juniata, Lancaster, Lebanon, Mifflin, Perry, Potter, Schuylkill, Snyder, Somerset, Venango, Warren, and York, treatment with diflubenzuron and Bacillus thuringiensis;

Rhode Island - 25,000 acres in Providence County, treatment with Bacillus thuringiensis;

West Virginia - 55,000 acres in the counties of Hampshire, Mineral, and Morgan, treatment with diflubenzuron.

Alternative actions for gypsy moth suppression projects were previously discussed in the Gypsy Moth Suppression and Eradication Projects Final Environmental Impact Statement as Supplemented- 1985, (FEIS) (pp. 14-24) issued March 8, 1985. The alternative selected by the USDA Forest Service in the FEIS was to provide financial and technical assistance to support an integrated pest management approach to suppress gypsy moth populations. The selected alternative guides USDA Forest Service consideration of annual State requests for financial assistance. The alternative consists of a combination of management tactics, including natural control factors, such as parasites and predators, biological, and chemical insecticides.

Decision Notice

The 1985 suppression projects proposed by State cooperators meet USDA Forest Service environmental, biological, and economic criteria for financial assistance. Therefore, I have determined that a Federal role exists.

It is my decision to provide Federal financial assistance and technical support for gypsy moth suppression projects as proposed by cooperating State agencies and discussed in this EA, to the extent that current Federal funds will permit.

This decision recognizes that gypsy moth populations remain at damaging levels within many areas of the generally infested Northeast, and that natural spread of the insect will continue into adjacent uninfested areas. It is the intent of the 1985 cooperative gypsy moth suppression projects to minimize defoliation and subsequent tree mortality, and where applicable, impede the spread of damaging gypsy moth populations.

Finding of No Significant Impact

The environmental consequences of the proposed 1985 suppression projects have been evaluated in this EA. The risk to human health associated with the use of chemical insecticides has also been evaluated in this EA, as has the risk to human health from accidental insecticide spills, and the cancer potency of carbaryl and diflubenzuron. In all cases, the realistic and worst case expected doses associated with the 1985 project are within acceptable margins of safety. Severe effects are possible from exposure to truck spills of concentrated carbaryl. Fortunately, the probability of such an accident occurring is extremely low, and precautionary measures will be implemented during the project to minimize the risk of occurrence.

Based on the analysis described in this EA. I have determined that the proposed 1985 cooperative suppression projects will not cause significant environmental impacts or adverse effects which have not already been addressed in the FEIS. Therefore, a revised or amended environmental impact statement is not needed. This decision was made considering the following factors: (a) all chemical and biological insecticides are approved by the EPA; (b) applications of chemical and biological insecticides will comply with applicable EPA labels and State and Federal law; and (c) public involvement, public notification, treatment area selection, insecticide selection, performance standards, and monitoring procedures that are implemented in gypsy moth suppression projects will reduce the potential for adverse environmental effects on the areas treated, and will minimize the risk of exposure to individuals residing in or visiting areas treated.

Copies of this EA and the Gypsy Moth Suppression and Eradication Projects - Final Environmental Impact Statement - as Supplemented 1985 (FEIS) are available for public review at the following offices:

Delaware Department of Agriculture
Division of Production and Promotion
Forestry Section, Drawer D
Dover, DE 19901

Maryland Department of Agriculture
Offices of Plant Industries and Pest Management
50 Harry S. Truman Parkway
Annapolis, MD 21401

New Jersey Department of Agriculture
Division of Plant Industry
CN-330
Trenton, NJ 08625

New Jersey Department of Environmental Protection
Bureau of Forest Management
CN-401
Trenton, NJ 08625

Pennsylvania Department of Environmental Resources
Bureau of Forestry
100 Evangelical Press Building
Third and Reily Streets
Harrisburg, PA 17120

Rhode Island Department of Environmental Management
Division of Forest Environment
RFD #2, Box 851
North Scituate, RI 02857

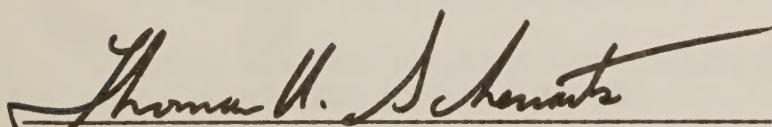
West Virginia Department of Agriculture
Division of Plant Pest Control
State Capitol
Charleston, WV 25305

USDA Forest Service
Northeastern Area State and Private Forestry
370 Reed Road
Broomall, PA 19008

USDA Forest Service
Northeastern Area State and Private Forestry
Louis C. Wyman Forestry Sciences Laboratory
Concord-Mast Road
Durham, NH 03824

USDA Forest Service
Northeastern Area State and Private Forestry
180 Canfield Street
Morgantown, WV 26505

This decision is not subject to administrative review pursuant to 36 CFR
211.18. Implementation may take place immediately after the date of this
decision.


THOMAS N. SCHENARTS
Area Director
Northeastern Area State and Private Forestry
370 Reed Road
Broomall, PA 19008

4/23/85
(DATE)

TABLE OF CONTENTS

	Page
INTRODUCTION	1-3
PURPOSE AND NEED FOR ACTION IN 1985	3-6
PROPOSED 1985 COOPERATIVE SUPPRESSION PROJECTS	6-7
ALTERNATIVES TO THE PROPOSED ACTION	8
ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION	8-10
RISK TO HUMAN HEALTH	10-16
ACCIDENTAL EXPOSURES	16-19
ADMINISTRATIVE CONSTRAINTS TO THE PROPOSED ACTION	20
CONSULTATION WITH OTHERS	21
LIST OF PREPARERS	21-24
 APPENDIX (STATE AGENCY PROPOSALS)	
DELAWARE DEPARTMENT OF AGRICULTURE, DIVISION OF PRODUCTION AND PROMOTION	A1-A14
MARYLAND DEPARTMENT OF AGRICULTURE, OFFICE OF PLANT INDUSTRIES AND PEST MANAGEMENT	A15-A41
NEW JERSEY DEPARTMENT OF AGRICULTURE, DIVISION OF PLANT INDUSTRY	A43-A62
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION, BUREAU OF FOREST MANAGEMENT	A63-A100
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES, BUREAU OF FORESTRY	A101-A125
RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, DIVISION OF FOREST ENVIRONMENT	A127-A140
WEST VIRGINIA DEPARTMENT OF AGRICULTURE, PLANT PEST CONTROL DIVISION	A141-A152

INTRODUCTION

In 1983, the USDA Forest Service and Animal and Plant Health Inspection Service (APHIS) conducted an environmental analysis for gypsy moth suppression and eradication projects which was documented in a draft Environmental Impact Statement (DEIS) and issued for public review on December 28, 1983. During the review period for the DEIS, issues and concerns were raised indicating the need for further consideration of the human health effects associated with the use of chemical insecticides, or some type of analysis associated with the proposed use of insecticides in gypsy moth suppression or eradication projects. In responding to those concerns, USDA Forest Service and APHIS prepared a risk analysis using worst case assumptions which expanded upon the discussions in the DEIS of the health risks associated with the use of acephate, carbaryl, diflubenzuron, and trichlorfon, as used in gypsy moth suppression and eradication projects. The environmental analysis initiated in 1983, and the risk analysis prepared as a result of issues and concerns raised during the DEIS review period were documented in a Final Environmental Impact Statement - 1984 (FEIS-1984). Subsequent to the publishing of the FEIS - 1984, additional comments and new information about the chemical insecticides were made available resulting in the decision to supplement the FEIS - 1984 (August 23, 1984, Federal Register Vol. 49:3347). This supplemented document, now referred to as the Gypsy Moth Suppression and Eradication Projects, Final Environmental Impact Statement as Supplemented - 1985 was transmitted to the U.S. Environmental Protection Agency (EPA) and the public on March 8, 1985. This document hereafter referred to as the FEIS, incorporates significant revisions to the section on human health and its risk analysis. A subsequent 30-day review period was provided before a decision regarding implementation of the FEIS was made. Following evaluation and consideration of written comments received, a Record of Decision was signed on April 15, 1985.

The FEIS and the Record of Decision are available for examination in the USDA Forest Service Office located at: 14th and Independence Avenue SW, Washington, District of Columbia; and USDA Forest Service, Northeastern Area State and Private Forestry Offices located at: 370 Reed Road, Broomall, Pennsylvania; Louis C. Wyman Forestry Sciences Laboratory, Concord-Mast Road, Durham, New Hampshire; and 180 Canfield Street, Morgantown, West Virginia.

The alternative selected in the FEIS is to provide financial and technical assistance for implementation of an integrated pest management (IPM) approach to gypsy moth suppression and eradication. An IPM approach provides a framework in which to view gypsy moth infestations on a regional scale, allowing for more efficient implementation of direct suppression methods where needed while maximizing reliance on established natural mortality factors over the majority of infested acres. The IPM approach, as implemented by the USDA Forest Service, does not include attempts to eradicate gypsy moth populations; rather, the suppression of potentially damaging populations through a combination of methods is the overall objective. Methods comprising an IPM approach include the use of insecticides, parasite and predator management, gypsy moth mating pheromone and sterile or partially sterile gypsy moth life stages. These methods, alone or in combination, may eventually meet short-term and long-term gypsy moth management goals; however, some of this technology still requires development. Currently, only the biological and chemical insecticides are considered viable components for meeting the objectives of gypsy moth suppression projects (FEIS p. 72). The use of gypsy

moth pheromone, parasite and predator management, and sterile or partially sterile gypsy moth life stages are undergoing field evaluations with encouraging results. Forest stand manipulation techniques (known as hazard reduction) still require much more research and field evaluation.

In accordance with the National Environmental Policy Act of 1969 (NEPA), the USDA Forest Service and APHIS contacted Federal, State and local agencies, private industry, environmental and related private organizations, and interested individuals (FEIS, Appendix A), and asked them to identify relevant issues and concerns relating to gypsy moth suppression and eradication projects. In addition, a 1983 court decision (Oregon Environmental Council vs. Kunzman et. al. CA No. 82-3232, DC No. CV 82-504) amplified some of these same issues. The major issues and concerns identified through the public scoping process and the court cases, beginning with those most frequently mentioned, were (FEIS pp. 8-10): concern for human health; a need for more public education regarding gypsy moth suppression and eradication projects; a need for increased public involvement in selection and notification of insecticides and treatment areas; concern for environmental effects associated with insecticide use; a need for discussion of alternatives to chemical insecticides (new technologies); a need for developing a mechanism whereby past and current environmental impact statements can be obtained; a need to update environmental impact statements with new information on registered insecticides; increased emphasis on Integrated Pest Management and a more coordinated approach between Forest Service, APHIS, and State agencies; and a need for continued Federal and State involvement in suppression and eradication projects. These issues and concerns were used to guide the environmental analysis documented in the FEIS.

This Environmental Assessment (EA) documents the site-specific environmental analysis conducted by the USDA Forest Service and participating States for the 1985 proposed cooperative gypsy moth suppression projects. It is tiered to the FEIS. The environmental analysis considers the site-specific factors of each project such as treatment areas, insecticides, application methods, public involvement, public notification procedures, affected environment and associated environmental consequences. The decision to provide Federal financial and technical assistance to cooperating State agencies for gypsy moth suppression projects will be based on the environmental analysis documented in this EA. State agencies requesting financial and technical assistance for an IPM approach to meet the project objectives of reducing gypsy moth populations, tree defoliation and mortality in 1985 are:

Delaware Department of Agriculture
Maryland Department of Agriculture
New Jersey Department of Agriculture
New Jersey Department of Environmental Protection
Pennsylvania Department of Environmental Resources
Rhode Island Department of Environmental Management
West Virginia Department of Agriculture

Project proposals developed by these State agencies are presented in the Appendix of this EA.

The following USDA Forest Service criteria were used to determine whether a Federal role exists in proposed cooperative gypsy moth suppression projects:

Environmental acceptability.--Environmentally acceptable actions cause no irreversible adverse impacts on populations of nontarget organisms or their habitat. Actions which minimize short-term and long-term impacts on nontarget organisms and their habitats are preferred.

Biological effectiveness.--Biologically effective actions achieve project objectives of damage prevention or pest population management. Actions that promote long-term pest population stability below economically significant levels and reduce forest susceptibility to insect attack are preferred.

Economic efficiency.--Economically efficient actions produce benefits which exceed costs of obtaining project objectives. Project objectives for cooperative gypsy moth suppression projects are to reduce gypsy moth populations, tree defoliation and mortality. Actions which produce the greatest benefit to the greatest number of people or largest geographical area are preferred.

A Federal role exists when all of the above criteria are met and at least one of the following conditions can be identified: potential for international consequences; potential for national or regional economic impacts; need for Federal coordination as a result of project magnitude, intermingled ownership, or the involvement of more than one State; potential threat to unique resources; distribution of benefits to a large geographic area and a large number of people; or other special circumstances such as an infestation's magnitude.

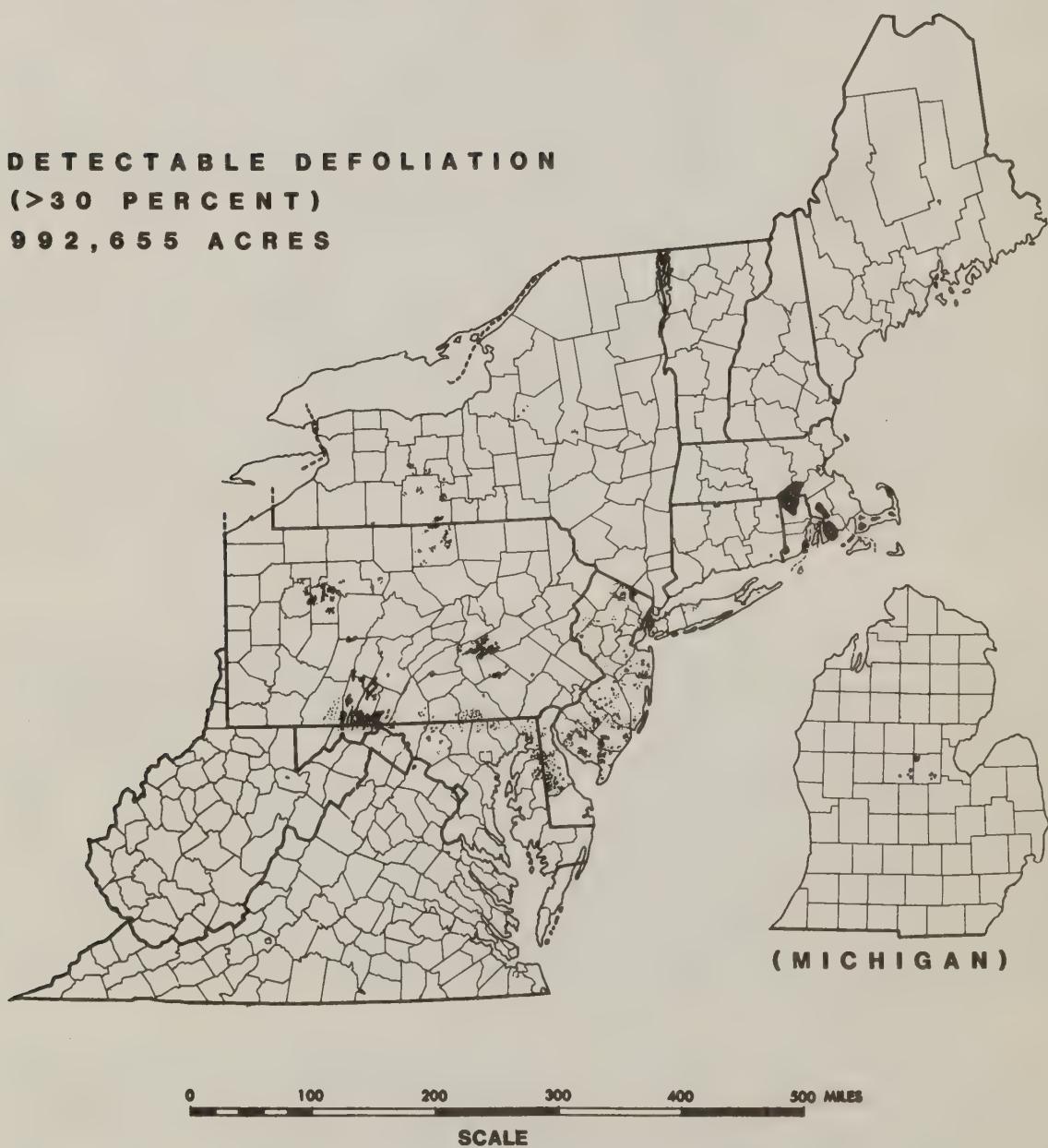
PURPOSE AND NEED FOR ACTION IN 1985

The current gypsy moth outbreak began in 1980 when more than 5 million acres were defoliated in the Northeastern States and Michigan. This represented a record in defoliated acres, more than 2.5 times the previous total observed in 1971. Gypsy moth activity increased dramatically in 1981 and caused tree defoliation on more than 12.8 million acres. New State defoliation records were reported that year in Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, New Hampshire, Pennsylvania, and Rhode Island. Insect activity declined slightly in 1982, causing defoliation on 8.1 million acres. Although defoliation levels decreased over most of the Northeast that year, insect activity was particularly brisk in Maryland, Delaware, southern and western portions of Pennsylvania, and in an earlier established infestation in central Michigan.

In 1983 gypsy moth-caused tree defoliation dropped to slightly more than 2.3 million acres. By 1984, acres defoliated fell to 992,655 (Table 1). Note that defoliated acres indicates only those areas where gypsy moth population densities are high enough to cause noticeable tree defoliation. Gypsy moth populations may exist over a much larger area, but not to a degree capable of causing tree defoliation. The location of defoliated areas as of July 1984 is shown in Figure 1.

As illustrated in Figure 1, the so-called leading edge of gypsy moth activity (those areas where population densities are particularly high) has moved south and west into southern Pennsylvania, Delaware, Maryland, West Virginia, and Virginia. From a pest management viewpoint, this is very important in that this movement is towards highly susceptible areas of contiguous forest land.

**FIGURE 1.--AREAS IN WHICH GYPSY
MOTH DEFOLIATION
OCCURRED IN 1984**



**(PREPARED BY USDA FOREST SERVICE
BASED UPON STATE SURVEYS)**

Table 1.--Gypsy moth defoliation, 1982-84*

State	1982	1983	1984
Connecticut	803,802	153,239	544
Delaware	1,265	2,992	14,203
Maine	574,537	16,285	1,892
Maryland	9,162	15,870	41,824
Massachusetts	1,383,265	148,133	185,520
Michigan	92	457	6,425
New Hampshire	878,273	560	0
New Jersey	675,985	340,285	98,695
New York	825,629	290,843	33,678
Pennsylvania	2,351,317	1,360,824	444,900
Rhode Island	658,000	53,880	164,600
Vermont	9,864	0	0
Virginia	0	0	374
West Virginia	0	0	0
Total	8,171,191	2,383,368	992,655

*Total represents moderate and heavy defoliation, in excess of 30 percent only.

Although the total acres of defoliation caused by the gypsy moth has decreased since 1980, 1984 predictive estimates of gypsy moth population densities indicate that some areas are likely to encounter severe defoliation in 1985 ^{1/}. In New Jersey, egg mass counts indicate increasing gypsy moth populations, particularly in the northern part of the State. In Rhode Island, egg mass counts in excess of 1,000 masses per acre occur on at least 100,000 acres, primarily within Providence County. Both of these States anticipate significant amounts of tree mortality unless defoliation in 1985 is minimized.

Delaware, Maryland, Pennsylvania and West Virginia are States at the leading edge of gypsy moth activity. Suppression of gypsy moth populations in these States can impede the movement of infestations further south and west, as well as prevent tree defoliation and mortality. In Delaware, a four-fold increase in egg mass density threatens the spread of gypsy moth defoliation into Delaware's southernmost county, the hub of its forest products industry.

^{1/} A commonly accepted standard equates egg mass densities of 250 per acre as a population density which will result in visible tree defoliation the following spring. As the egg mass density increases, so does the potential for resulting spring defoliation.

In Pennsylvania, damaging infestations have occurred in 56 of 67 counties as the outbreak moves south and west through the State, and now threatening Ohio and West Virginia. In Maryland, outbreaks of defoliating populations are evident along the Mason-Dixon Counties from Baltimore to Allegany, and along the northeastern shore of the Chesapeake Bay. Egg mass density estimates well in excess of 1,000 egg masses per acre have been reported.

In West Virginia, egg mass densities in excess of 500 per acre have been reported in the eastern-most counties, particularly in those areas adjacent to Maryland. Defoliation has been prevented through past suppression actions.

Overall, potentially damaging gypsy moth infestations represent a pest management problem of regional magnitude. It requires the intervention of various levels of government including States, counties, towns, and municipalities. In accordance with the selected alternative as implemented by the USDA Forest Service, and outlined in the FEIS, the States of Rhode Island, New Jersey, Delaware, Pennsylvania, Maryland and West Virginia have requested Federal financial assistance for gypsy moth suppression projects in 1985. The specific objectives of these projects are outlined by State in the Appendix. In general, however, all of the objectives seek to minimize tree defoliation, prevent tree mortality, and reduce gypsy moth populations to nondamaging levels. In some areas, the suppression of gypsy moth populations is also intended to impede the regional spread of the insect.

Within each State, the level of Federal financial support provided is dictated by landownership patterns within the proposed treatment areas and the availability of Federal funds.

PROPOSED COOPERATIVE SUPPRESSION PROJECTS FOR 1985

Site-specific information for gypsy moth suppression projects proposed by those State agencies requesting USDA Forest Service financial assistance is presented in the respective State proposals in the Appendix. State proposals discuss project objectives, issues and concerns, safety considerations, affected environment, effects of implementing the project, treatment area selection criteria, insecticide selection criteria, insecticide application methods, public involvement and public notification procedures, precautionary measures, constraints, and performance monitoring. Gypsy moth suppression projects are generally implemented between late-April and mid-June. However, exact dates may vary by geographic area depending upon foliage and insect development. All State projects propose to use registered biological and/or chemical insecticides to augment natural controls in an IPM approach in order to meet specific project objectives. A summary of the proposed gypsy moth suppression projects are shown in Table 2.

Table 2.--Summary of proposed State cooperative gypsy moth suppression projects - 1985

State	Requesting Agency	Treatment Type	Acres Proposed for Treatment	Treatment Location	Appendix
DE	State Department of Agriculture	Single application of <u>B. t.</u> ^{1/} , at 20 BIU's ^{2/} per acre at a rate of 96 oz. per acre.	53,000	Residential and State land in New Castle and Kent Counties.	Pages A-1 to A-14
MD	State Department of Agriculture	Single application of <u>B. t.</u> , at 12 BIU per acre at ² rates. 96 and 128 oz. per acre.	30,000	Residential and rural land Statewide.	Pages A-43 to A-62
		Single application of diflubenzuron ^{3/} at .031 lb active ingredient/acre at 2 rates, 96 and 128 oz. per acre.	88,000		
		Single application of carbaryl ^{4/} at 1.0 lb/acre at a rate of 96 oz. per acre.	2,000		
NJ	State Department of Agriculture	Single application of <u>B. t.</u> , at 16 BIU per acre at a rate of 96 oz. per acre.	46,000	Residential and recreational land in 50 municipalities primarily in the southern half of the State.	Pages A-63 to A-100
NJ	State Department of Environmental Protection	Single application of <u>B. t.</u> , at 16 BIU per acre at ² rates, 64 and 96 oz. per acre.	6,000	State-owned forests and parks.	Pages A-15 to A-41
PA	State Department of Environmental Resources	Single application of <u>B. t.</u> , at 12 BIU per acre at a rate of 128 oz. per acre.	71,700	High-use, residential/rural land in the central two-thirds of the State.	Pages A-101 to A-125
		Single application of <u>B. t.</u> at 20 BIU per acre at a rate of 128 oz. per acre.	32,000		
		Single application of diflubenzuron at 0.03 lb. a.i./acre at a rate of 128 oz. per acre.	108,300	Public forest land in the central two-thirds of the State.	
RI	State Department of Environmental Management	Single application of <u>B. t.</u> at 12 BIU per acre at a rate of 64 oz.	25,000	Forested Residential in Providence County.	Pages A-127 to A-140
WV	State Department of Agriculture	Single application of diflubenzuron at 0.03 lb a.i./acre at a rate of 128 oz per acre.	55,000	Forested/rural land in eastern West Virginia.	Pages A-141 to A-152

1/ B. t. is an abbreviated use of the name Bacillus thuringiensis, a bacterial insecticide pathogenic to the larval state of many lepidopterous insects.

2/ BIU is an abbreviated use of the term billions of international units which is an accepted reference standard of measurement for the potency of B. t. formulations.

3/ Diflubenzuron is the active ingredient (a.i.) of insecticide formulations sold under the tradename Dimilin®.

4/ Carbaryl is the active ingredient (a.i.) of insecticide formulations sold under the tradename Sevin®.

ALTERNATIVES TO THE PROPOSED ACTION

In the analysis documented, four alternatives including a "no-action" alternative were considered and evaluated (FEIS pp. 14-24). The USDA Forest Service considered those alternatives that adhere to USDA guidelines governing participation in cooperative projects, address issues, concerns and opportunities identified as a result of scoping activities, and meet the objectives of cooperative gypsy moth suppression projects. The alternatives considered in addition to the selected IPM alternative were: (See Record of Decision, signed by R. Max Peterson, Chief, USDA, Forest Service, and Bert W. Hawkins, Administrator, USDA, APHIS, April 15, 1985).

- 1) No action. The no action alternative would result in no USDA Forest Service funds for State suppression projects.

Although Federal funds would not be provided under this alternative, State agencies, communities, or individuals would not be precluded from financing their own action against the gypsy moth. Federal technical assistance would continue to be available to State agencies.

- 2) Chemical insecticide treatment to suppress gypsy moth infestations. The chemical insecticide treatment alternative would allow USDA Forest Service financial assistance to cooperating State agencies for proposed projects utilizing only chemical insecticides such as carbaryl, trichlorfon, diflubenzuron, and acephate.
- 3) Biological insecticide treatment to suppress gypsy moth infestations. The biological insecticide treatment alternative would allow USDA Forest Service financial assistance to cooperating State agencies for projects using only biological insecticides. The biological insecticides considered and evaluated during the environmental analysis were formulations of B. t. and the gypsy moth virus (NPV).

ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

Implementation of the IPM approach to gypsy moth suppression will result in reliance primarily on natural mortality factors such as parasites, predators, disease and weather to exert biological pressure on gypsy moth populations over the majority of infested acres. The insecticide component of the IPM approach is proposed for those forested communities and high-value or high-use forests where natural mortality factors are not preventing gypsy moth populations from causing unacceptable tree defoliation and tree mortality. The area proposed for insecticide treatment by State agencies requesting participation in 1985 USDA Forest Service cooperative gypsy moth suppression projects is 517,000 acres.

The insecticide component of the IPM approach consists of treatment with chemical and biological insecticides. The use of chemicals is proposed within parts of the Pennsylvania and Maryland treatment areas and all of the West Virginia treatment area. How specific sites are selected for chemical treatment is described in detail within the appropriate State sections found

in the Appendix. In general, chemicals are recommended for use in those situations where gypsy moth population density is very high and tree damage and mortality are imminent if the populations are not reduced, and characteristics of the site permit the use of chemicals based upon label requirements.

In the areas proposed for the use of chemical insecticides for gypsy moth suppression, the beneficial effects upon the environment include immediate foliage protection and population reduction, and the prevention of tree mortality. This will result in the overall preservation of the existing forest habitats.

Three residential/rural areas in Maryland are proposed for treatment with carbaryl. Two of these areas are in Maryland's eastern shore, and one is in the central Piedmont Region. Application of carbaryl may cause adverse effects upon some nontarget organisms within the treatment area. Some aquatic insects are very susceptible to carbaryl, as are honeybees. No significant adverse effects have been reported on amphibians, reptiles, fish or birds within areas treated by the registered use of carbaryl. For the 1985 treatment areas, carbaryl will not be used in areas characterized by open water habitats or an abundance of apiaries. A detailed discussion of the environmental consequences of the use of carbaryl can be found in the FEIS pp. 48-61.

Diflubenzuron is proposed for use on State forest lands in Pennsylvania, rural/forest land in Maryland, and rural/forest land in West Virginia. Diflubenzuron acts as an insect growth regulator with its primary effect occurring through ingestion. It is toxic to insects solely by inhibiting the formation of the substance chitin found in insect body walls.

Diflubenzuron is currently labelled by the EPA for use in forested areas with 1 house or less per 10 acres. Diflubenzuron persists in the environment for a short period of time, and consequently has limited environmental impact. Some nontarget organisms, particularly crustaceans and certain aquatic insects are adversely affected by diflubenzuron. The use of diflubenzuron in the proposed treatments limits its use only to those areas with very high gypsy moth populations and that meet EPA label requirements for human population densities. It will not be applied in areas of open water habitat. A detailed discussion of the environmental consequences of the use of diflubenzuron in forested areas can be found in the FEIS (p. 61-64).

Implementation of the biological insecticide treatment component of the IPM approach will, in the year of treatment, reduce gypsy moth populations, protect the foliage of host trees, but will not provide immediate reduction in insect populations. In addition, high density gypsy moth populations may require retreatment the following year if biological insecticides are used. The timing of biological insecticide application is critical as the insecticide must be ingested by early instar (small larvae) to be effective. Biological insecticides are proposed for use in Delaware, New Jersey, Rhode Island, and parts of Pennsylvania and Maryland. The biological insecticides are considered environmentally safe. They have no known degrading effect on the environment in which they are applied and will not affect nontarget organisms, except other lepidopterous larvae (caterpillars) if they are present at the time of treatment. Gypsy moth parasite populations may be

indirectly reduced as a result of the reduction in the number of gypsy moth larvae that would be available to serve as hosts in the treated area. The biological insecticides currently registered by the EPA for gypsy moth suppression are formulations of the bacterium Bacillus thuringiensis (B. t.) and the gypsy moth nucleopolyhedrosis virus (NPV). Formulations of the NPV product, Gypchek, are currently under field evaluation to improve the product's efficacy under operational conditions; therefore, only formulations of B. t. are proposed for use in 1985 cooperative gypsy moth suppression projects (see Table 2). A detailed discussion of the environmental consequences associated with the use of biological insecticides is presented in the FEIS (p. 68-72).

Risk to Human Health

The risk to human health associated with the application of the insecticides registered for use in gypsy moth suppression projects is discussed in detail within Appendix F of the FEIS, and within each State project proposal found in the Appendix of this document (see Human Health sections).

The biological insecticide B. t. is considered to be environmentally safe. In reviewing the available literature, only 2 reports of any adverse human health effects have been found. These reports discuss the isolation of vegetative cells and spores of B. t. from a skin infection, and an eye ulcer. Neither incident occurred during the operational use of B. t. during gypsy moth suppression. No adverse human health effects are associated with the aerial application of B. t.. As a consequence, the remainder of this section is concerned only with the chemical insecticides proposed for use.

Risk to human health from exposure to chemical insecticides is evaluated by reviewing the available toxicological information for each chemical insecticide proposed for use, determining probable exposure rates, and evaluating the possibility of exposure. In this process, a comparison is made between what is likely to happen (a realistic occurrence) versus the worst that could possibly happen (a worst case). The entire process is called a risk analysis and is developed to evaluate the risk to people who live in or near a treatment area, as well as for people directly involved in the project (occupational exposure) (see FEIS, Appendix F).

In evaluating the toxicological risk, the effects upon different animals are tested for acute and chronic toxicity, as well as genetic effects such as mutations and cancer. Toxicological risk is measured by an internationally recognized standard known as the Acceptable Daily Intake (ADI). The ADI represents the maximum dose of a substance that is anticipated to be without lifetime risk to humans when taken daily. It is based upon an exposure dose that has demonstrated no observable effect (NOEL) in laboratory tests and is established by the U.S. Environmental Protection Agency (EPA) and the World Health Organization (WHO). The ADI incorporates a safety factor which compensates for differences between laboratory test animals and other mammalian species such as humans. This is done by dividing the no observable

effect level (NOEL) derived usually from multigeneration feeding studies by a factor that, in effect, provides a margin of safety between laboratory tests and humans (FEIS p. F-9). The following tabulation ^{1/} illustrates the NOELS and ADIs for chemicals proposed for use in 1985 gypsy moth suppression projects.

No Observable Effect Level (NOEL)	ADI
Carbaryl	3.125 mg/kg/day
Diflubenzuron	1.1 mg/kg/day

*mg/kg/day is milligrams of the compound per kilogram of body weight of the animal tested per day.

Doses that are equal to or below the ADI are said to be within an acceptable margin of safety. Exposure to a chemical insecticide during a treatment project includes the direct exposure of people during these levels indicate amounts of insecticide a person could be exposed to during a treatment project. They are based upon exposure studies as documented in the FEIS pp. F-26 - F-51 and secondary exposures resulting from residues in food or water.

Calculated realistic and worst case exposure levels to carbaryl for the general public and workers are presented in Table 3.

For the general public greatest possible exposure to carbaryl would occur to people who are outside during the application (observers) and received a direct application and then consume only food and water containing carbaryl residues. In all cases, the realistic exposure doses are found to be below the accepted ADI and are therefore considered to be within acceptable margins of safety. Doses that exceed the ADI result from the worst possible case exposures that include a dietary component. The questionable worst case doses for carbaryl are all very close to the established ADI, and more than 15 x less than the lowest NOEL. The lowest NOEL is based upon a teratogenicity study in beagle dogs (3.125 mg/kg/day), however, it is significant to note that although a safety factor of "100" is used to derive the ADI for carbaryl, the EPA does not apply that safety factor to the lowest NOEL. Instead, a NOEL of 10 mg/kg/day is used. Toxicological data as shown in the FEIS p. F-115, identifies 5 other NOELS in other animal species all of which are higher than the dog NOEL of 3.125 mg/kg/day. The higher the NOEL, the higher the dose that results in no observable effect. Using one of the other teratogenic NOEL's for comparison to the questionable worst case doses results in margins of safety from 750 to more than 1200. This safety is further supported by an epidemiology study conducted in Cape May County, New Jersey, by the New Jersey Department of Health. The study concluded that there was no increase in birth defects in the counties where carbaryl was applied, compared to counties where it was not applied (FEIS p. F-89). Finally, any possible health risk to the general public from exposure to carbaryl involves worst case doses only, in addition to the daily consumption of meat, vegetables, fruits, and liquids which contain insecticide residues.

1/ Excerpted from FEIS (p. F-122).

Table 3.--Relationship of expected doses to established exposure thresholds for carbaryl
 (1 lb. a.i. per acre).

Exposure Scenario	Expected Dose (mg/kg/day)	Realistic		Worst Case	
		Relationship to Established Threshold*	Relationship to Established Threshold*	Expected Dose (mg/kg/day)	Relationship to Established Threshold*
<u>General Public</u>					
Direct	0.0022	46	1420	0.010	10
Drift	0.0014	71	2,232	0.0054	19
Indirect	0.00044	227	7,102	0.0018	56
Direct and Dietary	0.012	8	260	0.124	-1
Indirect and Dietary	0.0098	10	319	0.1178	-1
Observer and Dietary	0.012	8	260	0.174	-2
Dietary Only	0.0094	11	332	0.116	-1
<u>Occupational</u>					
Mixers/Loaders	0.046	2	68	0.20	16
Observers	0.0022	46	1420	0.058	2
					54

* Positive numbers indicate the number of times the expected dose is below the established ADI and NOEL. Negative numbers are number of times the expected dose is above established ADI and NOEL.

Each State conducting a treatment project is required to implement precautionary measures to minimize the risk of exposure of individuals either working on the project or affected by the project.

Under laboratory conditions, carbaryl has been reacted with nitrite compounds in the presence of an acid catalyst to form N-nitrosocarbaryl, a compound of uncertain carcinogenicity. If N-nitrosocarbaryl is formed in nature, it is most likely to occur only under acidic conditions similar to those found in the stomach. The possible risk of cancer resulting from N-nitrosocarbaryl is discussed in the FEIS Appendix F, by making the worst case assumption that carbaryl would be converted to N-nitrosocarbaryl in the stomach (FEIS pp. F-94 - F-96). The lifetime risk of cancer to individuals exposed to carbaryl, and thus N-nitrosocarbaryl during a suppression project is estimated to be 3.46×10^{-10} or 3.46 in ten billion (see FEIS p. F-131). This level of cancer risk is more than 1,000 times lower than the risk of cancer caused by smoking 2 cigarettes in a lifetime or being exposed to naturally occurring cosmic rays for 20 days at sea level (FEIS p. F-133).

Diflubenzuron, trade name Dimilin, is a new generation insecticide. It acts as an insect growth regulator by interfering with the synthesis of chitin, a substance found in the body wall of insects. Diflubenzuron has very low mammalian and nonmammalian toxicity exclusive of insects. The ADI, as indicated above, is set at 0.011 mg/kg/day.

Possible realistic and worst case exposure levels to diflubenzuron for the general public and workers are presented in Table 4. These expected dose levels for humans are based upon an application rate of 0.03 lb. of active ingredient per acre. The FEIS p. F-125, bases exposure doses upon .06 lb. of active ingredient per acre, however, all 1985 proposed uses of diflubenzuron indicate that .03 lb. of active ingredient per acre will be applied.

As illustrated in Table 4, all realistic and worst case exposure doses to the general public and workers are well below the ADI established by EPA. This suggests that these doses are well within acceptable margins of safety. As stated earlier, each State conducting a treatment project is required to implement precautionary measures to minimize the risk of exposure of individuals either working on the project or affected by the treatment.

Diflubenzuron has been found to be nonmutagenic and noncarcinogenic even at high dose levels (FEIS p. F-12-14). Even though diflubenzuron is considered noncarcinogenic, there is uncertainty about the carcinogenic potential of one of its metabolites, 4-chloroaniline. This metabolite is formed by the liver, and any risk is related primarily to eating meat, particularly fish that contains it.

The cancer risk associated with eating fish or meat containing the metabolite 4-chloroaniline is discussed in detail in the FEIS Appendix F (p. F-83-84). Although the cancer risk associated with diflubenzuron could be considered to be zero, FEIS Pg. F-83, a worst case analysis was made because

Table 4.--Relationship of expected doses to established exposure thresholds for diflubenzuron, applied at a rate of .03 lb. active ingredient per acre.

Exposure Scenario	Expected Dose (mg/kg/day)	Realistic		Worst Case	
		Relationship to Established Threshold*	Relationship to NOEL	Expected Dose (mg/kg/day)	Established Threshold ADI
<u>General Public</u>					
Direct	0.00065	170	16,924	0.0003	36
Drift	0.0000435	252	25,288	0.00016	68
Indirect	0.000013	846	84,616	0.000055	200
Direct and Dietary	0.00036	30	3,056	0.00395	3
Indirect and Dietary	0.000305	36	3,606	0.0037	3
Observer and Dietary	0.00036	30	3,056	0.0054	2
Dietary Only	0.000295	38	3,728	0.00365	3
<u>Occupational</u>					
Mixers/Loaders	0.0014	8	786	0.006	2
Observers	0.000065	170	16,924	0.00175	6
					184
					628

* Positive numbers indicate the number of times the expected dose is below the established ADI and NOEL. Negative numbers are number of times the expected dose is above established ADI and NOEL.

of the uncertainty surrounding 4-chloroaniline. Since no actual cancer threshold data exist for 4-chloroaniline, the FEIS assumes a value of about 1,000 times less than that of trichlorfon, another chemical insecticide registered for use in gypsy moth suppression projects, which is suspected of being a weak mutagenic agent. When using these assumptions, the lifetime cancer risk to an individual exposed to diflubenzuron is estimated to be 1×10^{-9} or 1 in 100 million. This risk level is 100 times lower than the risk of developing cancer after smoking 2 cigarettes in a lifetime or being exposed to naturally occurring cosmic rays for 20 days at sea level (FEIS p. F-133).

To estimate long-term human health hazards, lifetime cancer risks are used. These are 3.46×10^{-10} for carbaryl, and 1×10^{-9} for diflubenzuron, and represent the cancer risk to individuals exposed to dietary doses resulting from the consumption of contaminated food or water. These numbers reflect the cancer-causing potency of the chemical and the calculated lifetime dose encountered. They indicate the increased cancer risk over and above background levels present within the U.S. population. For the 1985 suppression projects, the possible cancer incidence is obtained by multiplying the lifetime cancer risk (above) by the population at risk within treatment areas. Site specific cancer risk is illustrated in Table 5.

Table 5.--Site specific potential risk to human health associated with the 1985 gypsy moth suppression project.

Insecticide	State	Acres to be treated	Ave. pop. density within treatment area	Lifetime cancer risk resulting from one application	Potential Cancer incidence per project (pop. density x (acres treated x (cancer risk))
Carbaryl	MD	2,000	0.57 people/ acre	3.46×10^{-10}	3.94×10^{-7}
Diflubenzuron	MD	88,000	0.07 people/ acre	1.0×10^{-9}	6.16×10^{-6}
Diflubenzuron	PA	108,300	0.005*	1.0×10^{-9}	5.42×10^{-7}
Diflubenzuron	WV	55,000	0.07 people/ acre	1.0×10^{-9}	3.85×10^{-6}

*Diflubenzuron in Pennsylvania is proposed for treatment in forest areas only.

As illustrated in Table 5, the potential risk to human health within treatment areas associated with the application of carbaryl and diflubenzuron is extremely low. In an estimated exposed population of 11,692 people (2,000 ac. x .57 people/ac. + 88,000 ac. x .07 people/ac. + 108,000 ac. x .005 people/ac. + 55,000 ac. x .07 people/ac.), it is estimated from the potential cancer incidence probability that there would be .00001 additional incidences of cancer above background levels as a result of exposure to carbaryl and diflubenzuron in 1985 treatment projects (3.94×10^{-7} + 6.16×10^{-6} + 5.42×10^{-7} + 3.85×10^{-6}). This, of course, assumes that everyone within the treatment area is equally exposed.

Accidental Exposures

The worst possible risk of exposure to chemical insecticides results from accidental events such as large spills. The size of the spill and resulting impact depends upon factors such as the source (tank truck or aircraft crash), proximity to water, and human population density. Major accidents that result in the uncontrolled release of an insecticide can happen during gypsy moth suppression projects. Historical records are used to develop the risk or probability of an accident occurring. This process is presented in detail in the FEIS, Appendix F (pp. F-52 - F-62). For this analysis the following probabilities for the occurrence of aircraft and vehicular accidents have been calculated from historical records:

<u>Accident Type</u>	<u>Probability of Occurrence</u>	
	On Land	In Water
Aircraft spill	5.1×10^{-4}	5.7×10^{-5}
Truck spill	1.08×10^{-5}	1.2×10^{-6}

These probabilities are adjusted to account for acres to be treated in 1985 and insecticide application rate. These site specific accident probabilities are illustrated in Table 6. They are presented here to illustrate the risk of exposure to chemical spills associated with each State project. Note that the probability of an accident occurring increases with the overall size of the project. In all cases, historical evidence suggests that the probability of aircraft or truck-related spills is small. Each State project is required to implement precautionary measures to minimize the possibility of accidental spills and resulting human exposure.

As indicated in Table 7, the greatest human health risk is associated with the dermal exposure to truck spills of carbaryl. Here, in both the realistic and worst case situations the expected exposure is estimated to be 6 times higher than the ADI. It is possible that dermal exposure to a truck spill could result in fatalities, depending upon promptness of medical attention. Consumption of water containing carbaryl residues could result in swelling of the liver or kidneys and/or symptoms of cholinesterase inhibition. As indicated in Table 6, the probability of a carbaryl carrying truck accident occurring in the 1985 Maryland treatment project is estimated to be 1 spill on land for every 92,000 projects of a 2,000 acre size; and, 1 spill in water for every 833,000 projects of a 2,000 acre size.

For diflubenzuron (Table 8) dermal and oral exposures to accidental spills are equal to or below all threshold values.

Table 6.--Accidental spill probabilities for 1985 gypsy moth suppression projects.

State	Insecticide	Acres to be treated	Estimated population density within treatment area required ^{1/}	No. of aircraft loads required ^{1/}	Probability of an aircraft spill ^{2/}		No. of people exposed ^{3/}	No. of trucks required ^{4/}	Probability of a truck spill ^{2/}	
					Land	Water			Land	Water
DE	<u>B. t.</u>	53,000	0.55/acre	177	9.02×10^{-2} (1/11)	1.0×10^{-2} (1/99)	1.4	8.3	8.96×10^{-5} (1/18519)	9.96×10^{-6} (1/166,667)
NJ (Ag)	<u>B. t.</u>	46,000	10/acre	153	7.08×10^{-2} (1/13)	8.72×10^{-2} (1/115)	25	5.4	5.8×10^{-5} (1/23,148)	6.5×10^{-6} (1/208,333)
NJ (For)	<u>B. t.</u>	6,000	5/acre	20	1.02×10^{-2} (1/98)	1.14×10^{-3} (1/877)	12.5	0.7	0.76×10^{-5} (1/92,593)	0.84×10^{-6} (1/833,333)
RI	<u>B. t.</u>	25,000	0.32/acre	83	4.2×10^{-2} (1/20)	4.7×10^{-3} (1/175)	0.8	3	3.24×10^{-5} (1/30,864)	3.6×10^{-6} (1/277,778)
WV	diflubenzuron	55,000	0.07/acre	183	9.33×10^{-2} (1/11)	1.04×10^{-2} (1/96)	.18	28	2.97×10^{-4} (1/3367)	3.3×10^{-5} (1/30,303)
PA	<u>B. t.</u>	71,700	3/acre	230	1.2×10^{-4} (1/8)	1.8×10^{-2} (1/68)	7.5	8	5.83×10^{-4} (1/11,574)	6.48×10^{-5} (1/104,167)
	diflubenzuron	108,300	0.005/acre	361	1.8×10^{-1} (1/5)	2.1×10^{-2} (1/39)	.013	54	5.83×10^{-4} (1/1,715)	6.48×10^{-5} (1/15,432)
MD	<u>B. t.</u>	88,000	0.07	293	1.49×10^{-1} (1/7)	1.67×10^{-2} (1/60)	.18	44	4.75×10^{-4} (1/2,105)	5.28×10^{-5} (1/18,939)
	carbaryl	2,000	0.57	7	3.57×10^{-3} (1/280)	3.99×10^{-4} (1/2,506)	1.43	1	1.08×10^{-5} (1/92,593)	1.2×10^{-6} (1/833,333)
	<u>B. t.</u>	30,000	0.75	100	5.1×10^{-2} (1/20)	5.7×10^{-3} (1/175)	1.88	3	3.24×10^{-5} (1/30,864)	3.6×10^{-6} (1/277,778)

1/ Acres to be treated/300 acres per load.

2/ Based upon historical accident probabilities (spill probability x no. of loads). Numbers in parentheses are possible no. of accidents per no. of projects of this size. As an example, in the Delaware project, the probability of an aircraft spill on land is estimated as 1 per 11 projects of this size.

3/ Population density x 2.5 acres (the estimated size of an aircraft spill on land).

4/ Acreage/2,000 gallon truck load. A 2000 gallon truck load of B. t. used at 12 BIU/acre will cover about 10, 667 acres.

Table 7.--Relationship of expected doses to established exposure following possible accidents for carbaryl.

Accident Scenario	Realistic			Worst Case		
	Expected Exposure (mg/kg/day)	Relationship to Established Threshold 1/ Dermal LD ₅₀	Relationship to Established Threshold 1/ NOEL	Expected Exposure (mg/kg/day)	Relationship to Established Threshold 1/ Dermal LD ₅₀	Relationship to Established Threshold 1/ NOEL
<u>Aircraft Spill</u>						
Dermal (Partial)	124	77	77	226	42	42
Dermal (Full)	257	37	37	468	20	20
Water Drinking 3/ 18	0.077	41	=ADI	0.140	22	=ADI
<u>Truck Spill</u>						
Dermal	27000	-3	-3	27000	-3	-3
Water Drinking 3/ 5	0.604	5	-6	0.604	5	-6

1/ Positive numbers indicate the approximate number of times the expected dose is below the established threshold. Negative numbers indicate the approximate number of times the expected dose is above the established threshold.

2/ The LD₅₀ is a measure of toxicity expressed as milligrams of toxicant per kilogram of body weight, the dose that kills 50% of the test animals. The acute dermal LD₅₀ for carbaryl is 9,580 mg/kg/day.

3/ Since a person may consume contaminated water for more than 1 day, the estimated dose is compared to the lowest NOEL and ADI, and not to the acute LD₅₀.

Table 8.--Relationship of expected doses to established exposure following possible accidents for diflubenzuron.

Accident Scenario	Realistic			Worst Case			
	Expected Exposure (mg/kg/day)	Relationship to Established Threshold $\frac{1}{}$	Expected Exposure (mg/kg/day)	Relationship to Established Threshold $\frac{1}{}$	Dermal LD ₅₀	NOEL	ADI
<u>Aircraft Spill</u>							
Dermal (Partial)	2.3		870		4.2		476
Dermal (Full)	3.5		571		6.4		312
Water Drinking $\frac{3}{}$	0.0015		733		0.0028		393
<u>Truck Spill</u>							
Dermal	428		5		778		3
Water Drinking $\frac{3}{}$	0.01		110	=ADI	0.018		61
						=ADI	

$\frac{1}{}$ / Positive numbers indicate the approximate number of times the expected dose is below the established threshold. Negative numbers indicate the approximate number of times the expected dose is above the established threshold.

$\frac{2}{}$ / The LD₅₀ is a measure of toxicity expressed as milligrams of toxicant per kilogram of body weight, the dose that kills 50% of the test animals. The acute dermal LD₅₀ for diflubenzuron is 2,000 mg/kg/day.

$\frac{3}{}$ / Since a person may consume contaminated water for more than 1 day, the estimated dose is compared to the lowest NOEL and the ADI, and not to the acute LD₅₀.

Administrative Constraints to the Proposed Action

Issues, concerns, and opportunities identified during public review are addressed in the FEIS (p. 8-10). In developing the environmental analysis for 1985 cooperative suppression projects, the USDA Forest Service required participating States to implement additional scoping activities in order to identify site-specific issues, concerns, or opportunities associated with planned 1985 treatments. A presentation of the scoping activities implemented, number of people attending, and the results are discussed in each State proposal in the Appendix of this document.

Public involvement at the community, township, county, and/or State level is an integral part of the treatment area selection process. Local news media and public meetings are used to inform the public that financial and technical assistance for suppression projects are available through State agencies. The State conducts field evaluations to determine if the proposed areas meet the necessary criteria for treatment. Guidelines for cooperating State agencies to encourage public involvement and awareness are presented in the FEIS (p. 77). Specific public involvement and notification procedures to be implemented in 1985 by cooperating State agencies are described in the respective State proposals in the Appendix of this EA.

Field evaluations of proposed treatment areas include assessment of egg mass size, density, and viability; previous defoliation; and land use category. Local residents, communities, or counties may decide whether or not to participate in a cooperative gypsy moth suppression project for those potential treatment areas that meet specific State criteria. These criteria are addressed in respective State proposals in the Appendix of this EA.

In general, the selection of an insecticide must consider the project objectives, environmental sensitivities of proposed treatment areas, and the biological and economic efficiency of each insecticide. In addition, the insecticide must be registered with the EPA for use on the proposed site, and the method for application must conform with label specifications. General selection criteria and performance standards for insecticide application, procedures and monitoring are addressed in the FEIS (p. 25-28). Specific standards and procedures to be implemented in 1985 are addressed in each respective State proposal in the Appendix of this EA.

The information presented in this EA and the information available in the FEIS indicate that the proposed actions meet USDA Forest Service environmental, biological, and economic criteria. A Federal role is identified as a result of the occurrence of gypsy moth infestations in several States. The benefits associated with achieving the objectives of State proposed cooperative suppression projects will accrue to many individuals over a large geographic area. The economic impacts associated with gypsy moth infestations are addressed in the FEIS (p. 10) and in each respective State proposal presented in this EA. As a result of the magnitude of the current gypsy moth infestation, Federal assistance for cooperative gypsy moth suppression projects will facilitate the implementation of an IPM approach for gypsy moth management in generally infested areas.

CONSULTATION WITH OTHERS

Public meetings were held during the environmental analysis for proposed cooperative gypsy moth suppression projects documented in this EA. The purpose of these meetings was to solicit public input into respective State plans for 1985 gypsy moth suppression projects. These sessions were announced through letters sent to interested individuals, agencies, and groups identified by cooperating States. The sessions were attended by individuals representing various agencies, organizations, and interests. State agencies also sponsored information meetings in affected counties and municipalities to allow for additional opportunity for public comment and involvement relating to cooperative suppression projects.

Throughout the various phases of planning and implementing cooperative gypsy moth suppression projects, State agencies and the USDA Forest Service consulted with a variety of groups, agencies, and organizations on technical and administrative items relating to individual State proposed suppression projects. These include other Federal, State and local governments, river basin commissions, environmental groups, universities, industry, individuals and others. Technical and administrative information from those consulted is used to improve project efficacy and efficiency while maximizing protection of the environment. These groups are identified in the FEIS (Appendix A) and in specific State proposals in this EA.

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APPENDIX

STATE AGENCY TREATMENT PROPOSALS - 1985

DELAWARE DEPARTMENT OF AGRICULTURE
GYPSY MOTH SUPPRESSION PROJECT - 1985

INTRODUCTION

Gypsy Moth Status

A fourfold increase in the intensity of the 1984-85 egg mass survey has led to the following conclusions of the status of the gypsy moth.

The southerly spread of gypsy moth has diminished. Egg mass surveys in Sussex County, Delaware, revealed no populations. The southern boundary of the generally infested area has not moved. There has been an increase in the infested acres to the east, into previously uninfested forestland.

Within the boundaries of the general infestation, there are few, if any, completely uninfested areas. Egg mass levels within the infested area are at outbreak levels (1,000-14,000/acre) and are building except where populations exceed 12,000 egg masses per acre.

53,000 acres of forested land will be sprayed in spring of 1985. (Figure 1).

Purpose and Need for Action

Delaware is one of the states on the leading edge of the general gypsy moth infestation. Approximately 90% of Delaware's 390,000 acres of forestland contains sufficient quantities of oak (>30% of stocking in sq. ft. of basal area per acre) to be classified as highly susceptible to gypsy moth defoliation. Annual estimates of the revenue produced by Delaware's forest products industry approach 20 million dollars. Loss of or reduced growth of the high-value oak component could have long-term economic ramifications for the regional forest products industry.

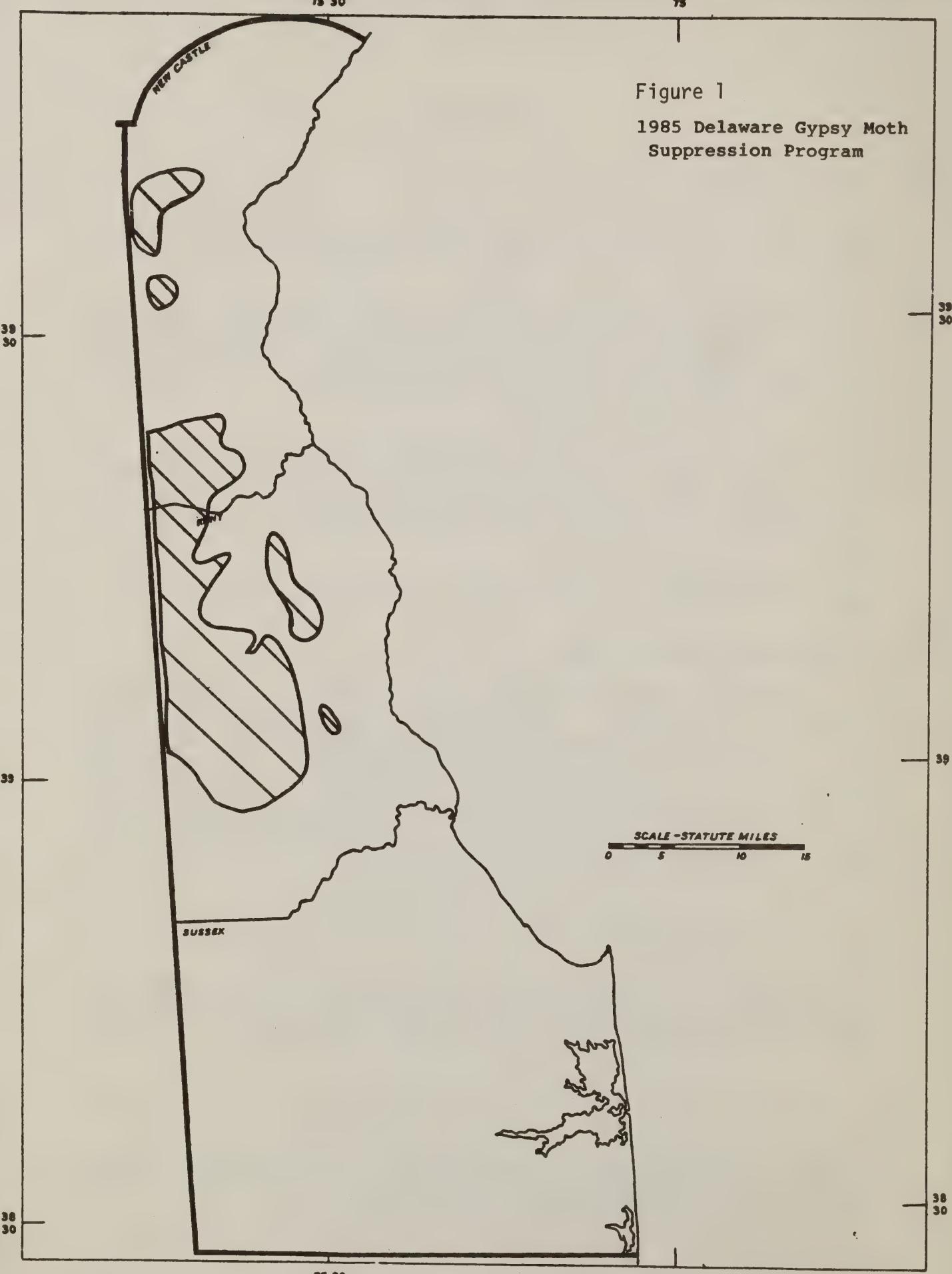
Estimates of dollar losses attributed to gypsy moth defoliation are well documented. (1)

The effect of gypsy moth defoliation on the rural, wood-using communities of western Delaware is more difficult to predict. Amish and Mennonite communities utilize their forestland as a part of

(1)

USDA-FINAL ENVIRONMENTAL IMPACT STATEMENT AS SUPPLEMENTED - 1985;
Gypsy moth suppression and Eradication Projects. USDA Forest Service, P.O. Box 2417, Washington, D.C. 20013.

DELAWARE



their everyday existence. Severe losses of growth, and mortality due to widespread defoliation would result in economic hardship for this unique part of Delaware's population.

A 1985 suppression project would continue to retard the spread of outbreak populations into Delaware's southernmost county, Sussex. Sussex County, the hub of Delaware's forest products industry contains sixty percent, or 236,000 acres, of Delaware's forestland. Sussex County forestland supplies forest products to at least twenty loggers and eleven sawmills in both Delaware and Maryland. More importantly, two large pulp and paper industries manage 20,000 acres of forestland and depend on a well-coordinated gypsy moth suppression project to protect their investment.

In conclusion, the goals of Delaware's 1985 gypsy moth suppression project are slightly different from most states. While not ignoring the importance of the people-problem aspect of the gypsy moth, the Delaware Department of Agriculture is integrating this concern with an eye to the future of an important statewide forest products industry.

PROPOSED PROJECT

Project Statement

In 1985, the Delaware Department of Agriculture (DDA), in accordance with the USDA-Forest Service 1985 EIS (1), proposes to use registered biological insecticides to augment natural controls in an IPM approach to suppress gypsy moth populations on 6,300 acres of public land and 46,700 acres of private forestland.

Organization

The lead agency for gypsy moth suppression activities in Delaware is the Delaware Department of Agriculture, Division of Production and Promotion. Authority to carry out this project is granted to the Department in Volume 2, Title 3, Chapter 11 of the Delaware State Code. The responsible state official for this project is Mr. Roland Derrickson, Division Director. Project planning and implementation will be carried out by a Division team composed of Mr. Timothy A. Kaden, Deputy State Forester; Mr. Kevin C. Donnelly, Service Forester; Mrs. Lynn Harrison, Entomologist; and Mr. Grier Stayton, Pesticide Compliance Supervisor.

Further information regarding the proposed 1985 project may be obtained by contacting Kevin C. Donnelly, Delaware Department of Agriculture, Forestry Section, Drawer D, Dover, DE 19903.

Objectives

The primary objectives of the 1985 suppression project are to prevent greater than 30% tree defoliation, thereby reducing potential tree mortality, and to reduce insect populations so that retreatment will be necessary on less than 25% of the 1985 spray blocks. The project will be considered successful if populations are reduced 85% and tree defoliation is kept under 30% on primary host species. Secondary objectives are to reduce the nuisance of gypsy moth larvae and to protect the aesthetic resource of Delaware's forestland.

Biological Monitoring

The following methods will be used to monitor gypsy moth populations and to evaluate project success:

Egg hatch evaluations -- Daily field observation of egg masses will be conducted in order to determine when hatch occurs and to estimate optimal treatment date.

Larval surveys -- Counts of surviving immatures on 36-inch branch samples will be conducted in 25% to 50% of the treatment blocks 1 week following insecticide application. This evaluation will be used as a measure of the secondary project objective.

Defoliation surveys -- Ocular estimates of defoliation from low flying, high-winged aircraft will be made during late June or early July. Estimates will be mapped according to the following categories: light (less than 30%); moderate (31 to 60 percent); and heavy (61 to 100 percent). This method will be used to measure attainment of the primary objective.

High Altitude Panoramic Color (I-R Photography) -- Delaware is committed to the USDA-Forest Service use of color IR photography to assess gypsy moth defoliation in 1985. It will be used to measure attainment of the primary objectives.

Egg Mass Surveys -- Counts of residual egg mass populations in treatment blocks will be conducted in late summer or early fall utilizing the 5-minute walk technique. These results will be compared to surveys conducted in the fall of 1984 and will be used to measure attainment of the primary objective.

Treatment Area - Table Breaking Down Statewide Numbers:

Areas to be treated include residential areas of western New Castle County (NCC), state forest land and rural residential forest land of southwestern NCC, state Fish and Wildlife land and rural residential and farm forestland of northwestern and central Kent County. (See Figure 1).

Selection Criteria -- The criteria used to determine spray blocks are listed below:

<u>New Castle County</u>	<u>Kent County</u>	<u>Total</u>
Private 12,000	Private 34,700	46,700
State 1,000	State 5,300	6,300
Total:		53,000

- 25 acre minimum spray block size
- 250 egg masses per acre
- 30% of the tree species within the block must be primary host species for gypsy moth
- priorities for treatment by land use category follow:
 - Priority #1) Forested residential land/forestland with mature timber
 - #2) State forest land
 - #3) Other State land or private land
 - #4) Infested land with less than 250 egg masses per acre

Treatment Selection

On a large scale project such as this the DDA wanted an insecticide considered to be environmentally safe and not known to present any significant risk to human health. Bacillus thuringiensis (B.t.) does not adversely affect fish, birds, mammals, or most non-target insects. The use of B.t. minimizes adverse impact on soil, air, and water when compared to chemical insecticides.

Treatment Type

The DDA will be using Bacillus thuringiensis on all 53,000 acres of the proposed treatment area for 1985. Application rates will follow label instructions and will be 20 Billion International Units (BIU's) per acre. Plyac, a sticker, will be used on 20% of the treatment area and only in the advent of bad weather. Areas will be re-treated if greater than 0.25 inches of rain falls within 6 hours after application.

Selection Criteria

The selection of B.t. as the insecticide for use in DDA's 1985 suppression project is based on the following criteria:

- I. Biological Efficiency
 1. Stomach poison
 2. Foliage protectorant
 3. Population control

II. Economic Efficiency

1. Tolerance established on agricultural crops
2. Insecticide cost per acre

III. Environmental Effects

1. Adverse effects on non-target insects
 - parasites and predators
 - pollinators
2. Adverse effects on wildlife as a group
3. Adverse effects on aquatic organisms
 - invertebrates
 - fish

Method

The insecticides proposed for use will be aerially applied by the following fixed-wing aircraft: 2-Beechcraft BE-18's, 2-Piper Braves, and 1-Grumman Ag Cat. Aircraft must meet F.A.A. guidelines and will be calibrated by DDA personnel prior to the start of the proposed project. Calibration will be periodically rechecked during application.

The contractor is a licensed pesticide applicator in Delaware and the pilots must be properly certified and licensed for the aircraft they are operating. All pilots participating in the proposed project are required to have extensive forest spraying experience.

Safety Considerations

Air operations safety is stressed to all people involved.

Standard precautions for pesticide handling are followed by all personnel involved with the program. All of the practices used in the handling and transporting of the insecticides are evaluated to minimize the chances of contamination and spillage. Trucks, tanks, hoses, pumps, and spray systems are inspected before the insecticide is introduced. Filters of definite size are required at several places in the system and are checked frequently. Samples are taken for future analysis if a problem develops. All insecticide transporting and handling is done by contract personnel. All DDA personnel working at the loading site will have hard hats with chin straps and goggles. A first aid kit and eye wash bottle will be available at each operation site. Fire extinguishers are provided by both the contractor and DDA.

A procedure to be followed in the event of an accident has been developed, giving specifics on information needed and agencies to be contacted. This plan will be reviewed and revised, if needed, before copies are distributed to the field personnel.

Notification of the scheduled treatment dates and program progress are made in local newspapers and on local radio news broadcasts. Campers and picnickers are notified in parks and campgrounds when they register. State personnel will visit day use areas just prior to spraying to inform other visitors. Spraying is generally done during the early morning hours, so human exposure is minimal.

Benefit/Cost Analysis

Real values protected will vary throughout the proposed treatment area. The 1985 proposed project will treat 34,980 acres of oak-hardwood forestland. Analysis of 1984 stumpage prices on timber sales within the proposed treatment area suggest an average timber value of \$875 per acre. Stand mortality following one years severe defoliation averages 20% and the average annual value loss of the dead timber is 12.5%. Delaware forest land owners could expect an average value loss, due to gypsy moth defoliation, of \$21.88 per acre. With an expected suppression cost of \$9.50 per acre, a minimum benefit/cost ratio for the proposed action is 2.3/1.

Benefit/cost ratios in forested residential land are more difficult to project. Shade tree evaluations favor large trees and make realistic benefit/cost ratio figures unrealistic. Stumpage values used in timber sales fail to account for aesthetic value and replacement costs. Our approach is to use removal cost which averages \$75 per tree. Using the \$9.50 suppression cost our benefit cost ratio for the 18,020 acres of forested residential land is \$7.89/1.

Scoping Activities

The scoping process for the 1985 DDA proposed suppression project consisted of six public meetings. Held in six different regions of the proposed treatment area, the meetings attracted 126 people.

Comments received from the public stressed several concerns:

Improvement of public notification prior to to public meetings and prior to spraying.

DDA's need to improve timing of spraying in order to treat areas at their most vulnerable time.

Perceived inconsistency of the effectiveness of control by biological insecticides.

AFFECTED ENVIRONMENT

Host Vegetation

Host vegetation within the treatment area is primarily broadleaved, deciduous trees of high susceptibility to gypsy moth defoliation. Upland, well drained sites are composed of stands of mixed red and white oaks, tulip-poplar, American beech, and hickories. The wetter, bottomland sites are characterized by mixed stands of pin and willow oak, swamp white and swamp chestnut oak, sweetgum, black gum, red maple, and a occasional ash. Important conifers include white and loblolly pine on the better-drained sites. Virginia pine is commonly found on less productive sites.

Relating host vegetation to land use categories, the better drained sites are commonly the first sites to be developed. Therefore the species common to these sites, especially the red and white oak groups, are the trees maintained by developers.

Likewise, as one moves into the west central and south west portions of the proposed treatment areas, the roadside housing developments are occurring in nearly pure stands of mixed bottomland oaks. These developments exist because of network of agricultural and forestland drainage ditches.

Looking at the proposed treatment area as one contiguous forest the primary hosts account for 40 to 50% of the per acre stocking as measured by square feet of basal area. On higher quality sites, the oak stocking approaches 60 to 70% of the basal area.

Potential Treatment sites

34 percent (18,020) acres of the treatment area is considered forested residential land. This area has the highest population density of 911 persons per square mile.

53 percent (28,090 acres) is considered low-density rural forestland. Basically this is farm forestland that adjoins and sometimes mixes with forested residential land. Population density is only 165 persons per square mile.

The remaining 13 percent (6,890) acres in relatively uninhabited forestland. This land is composed primarily of state forestland managed by the DDA and land managed by the Delaware Department of Natural Resources and Environmental Control.

Nontarget Organisms

The DDA target organism is the second, third, and fourth-stage larvae of the gypsy moth (Lymantria dispar). Any other plant, animal, insect, bird, fish, or human is a non-target organism. B.t., the insecticide of choice in the proposed project, is harmless to all organisms except leaf-eating caterpillars present during the period of insecticide application and the duration of its potency. It's effects on non-target insects such as lepidopterous parasites and predators of the gypsy moth is temporary.

The proposed project will not adversely affect any threatened or endangered species or their habitat.

The scoping meetings described on page 6 were used to announce the intent of the DDA's proposed project. Discussion with other natural resource professionals and review of federal documents did not reveal any rare or endangered species within the proposed treatment area.

Geography

The entire proposed project is within the coastal plain area of Delaware.

The Coastal Plain is low and partially submerged with many islands and marshes. The region as a whole consists of a series of southeasterly dipping layers of unconsolidated sands and clays. Its streams are slow-moving and winding, many becoming tidal estuaries before reaching the Delaware Bay. Streams along the extreme western edge of the State generally drain into the Chesapeake Bay.

ENVIRONMENTAL CONSEQUENCES

Beneficial Effects

Successfully meeting the objectives of the proposed program will reduce tree mortality by minimizing stress caused by severe defoliation. By accomplishing this the DDA hopes to prevent loss of stand values that approach 12% annually. Doing so will reduce the negative impacts of gypsy moth defoliation on Delaware's 20 million dollar forest products industry. A successful project will delay the spread of gypsy moth into Sussex County, which contains 60% of Delaware's forestland.

Furthermore, reducing gypsy moth defoliation 18,020 acres of forested residential land will reduce tree mortality and the subsequent expense problem of removal. Nuisance problems such as loss of residential shade cover, damage to shrubs, loss of backyard recreational values, and other landowner problems common to heavily infested residential areas.

Adverse Effects

Proper implementation of the suppression project should produce little or no adverse effect on the treatment areas. The insecticide that will be used has been approved and registered by the EPA. B.t. has no adverse effect on birds, mammals, fish, or non-target insects, except certain lepidopterous larvae.

Irreversible or Irrecoverable Commitment of Resources

Some resources must be committed to the operation of a suppression project. The primary irretrievable resources are the human resources of manpower and dollars. Some of these dollars are spent to purchase other resources such as gasoline. Oil, electricity, insecticides, and field supplies. All of these resources would be available for alternative enterprises if they were not used on this project. The public and the people controlling the allocation of these resources must consider this project to be worth the price. Another resource that is irreversible is the trees that die due to the added stress of defoliation. These trees can not be brought back to life; they will not sprout because the roots have also died. The wood is not completely lost if salvaged within a few years and other trees will grow to take its place, but replacement required many years.

Human Health

The 1985 EIS Draft Supplement to the Final Environmental Impact Statement documented two reports relating to B.t. and human health. These reports discuss isolation of vegetative cells and spores of B.t. from a severe skin infection and an eye ulcer. These incidences represent the first reported occurrence of an infection in humans that has been caused by any B.t. variety.

Workers handling concentrated forms of B.t. are going to have to use common sense. Goggles, gloves, and other protective clothing will be required by the DDA for any contractor personnel working with the concentrated mixtures.

Within the proposed treatment areas all citizens have been notified, through 6 public meetings, of these new health concerns when using B.t. in the proposed project.

ADMINISTRATIVE REQUIREMENTS AND CONSTRAINTS

Guidelines for Local Participation

In Delaware, there is no basic contiguous unit of government smaller than a county; therefore the DDA will coordinate the

suppression program in the State. Based on egg mass survey results obtained by the DDA, this Department will determine which infested sites meet the treatment selection criteria. The DDA then matches funding levels and acres requiring treatment to determine the most appropriate action.

Public Involvement

Public participation will be essential for implementation of the suppression program. The DDA sponsored six public scoping sessions, in six different locations, for the purpose of providing the general public an opportunity to express their concerns and ask questions about the proposed program. Efforts were made by the State to keep the media informed of the details of the proposed program and to encourage their support and cooperation during the treatment phase.

Primary responsibility for developing and implementing the suppression program, including determination of treatment sites, the insecticide to be applied, etc., belongs to DDA. However, the concurrence and support of the residents in the treatment areas will be necessary before any treatments are made. Information provided on requests made by residents in a treatment area may result in changes being made in the area treated.

Public Notification

Public information and public involvement are necessary to conduct a successful suppression program. The primary concern is to inform people in the designated treatment areas of the details regarding the proposed treatments. The public notification process is the responsibility of the DDA. The DDA will coordinate with other state agencies (Parks and Recreation, Fish and Wildlife, Public Safety etc.), and the Cooperative Extension Service in the public information process. To improve public notification, as cited in the 6 scoping sessions, the Department has increased it's news release list to over 90 different media sources and interested individuals, installed an automatic P.S.A phone, and distributed posters in public places throughout the proposed treatment area. One meeting will be held with county officials in each county to inform them of the proposed suppression program. Kevin C. Donnelly or Lynn Harrison will be the DDA contacts for public information.

Precautionary Measures and Constraints

The primary target of the insecticide application is the second through fourth instars of the gypsy moth larvae. Application will be made when wind speeds of 2 to 12 miles per hour are present and when temperatures are below 80° F, but warm enough for the insecticide to flow. The foliage must be dry with no threat of rain for 4 to 6 hours following application. Application will be timed so as to avoid spraying school children, picnickers, etc. No spraying will be done under thermal inversion conditions. Applications will

be made when oak leaf development is 40% to 60% complete. A representative sample of the treatment blocks in each region will be surveyed within 5 days before application to confirm egg hatch, presence of healthy larvae, and absences of large numbers of parasites.

The aircraft speed, altitude, swath width, nozzle type and angle, etc., will depend on the type of aircraft utilized. The pilot will be briefed about each spray block. Spray blocks will be shown on a USGS 7.5 minute series topographic quadrangle map. Some spray blocks will be marked from the ground with balloons. Also, there either will be a chase plane from which to monitor applications.

There will be radio communications between the DDA site-marking crews, the loading crews, the chase plane and the spray plane to allow unexpected problems to be resolved quickly. Ability to communicate quickly is important because authority to discontinue or cancel a site will reside with any employee of DDA or the contractor who discovers the problem.

Environmental Constraints

Buffer zones at least 100 feet wide around no-spray areas will be used to ensure that these areas will not be sprayed. B.t. will be applied near sensitive areas such as lakes, rivers, ponds, etc..., or at least a 100 foot buffer zone will be maintained when chemical insecticides are utilized. The precautionary measures and constraints that will be taken to minimize impact of this project on the environment, including non-target organisms, have been discussed in the "Application Constraints Section."

Human Health

Biological insecticides used according to label directions will have little or no human health risk associated with their use. However, the following additional precautionary measures will be utilized to minimize exposure of people working on the program and people in the treatment areas. The DDA will notify all residents within each spray block. A similar notification will be sent to residents on properties immediately adjacent to the spray blocks. This notification will contain the phone numbers of local contacts from which to obtain more information, to report any incident associated with the program and to make known objections to the program. State police and county or local police will be advised of the spray application prior to the application. Also, details of the daily spraying will be announced on local radio stations and will be printed in newspapers.

Probably the most important thing to minimize exposure in the treatment areas is to insure that the material is constantly being

applied at the proper rate and in the proper droplet size.

At the loading site standard pesticide mixing and handling precautions are followed according to the toxicity of the material being used. Loading is done with hose lines equipped with shutoff valves to reduce spillage.

Performance Monitoring

Monitoring is a continual process in the development and execution of this operation. The development of the target insect must be monitored as well as the quality of the application and the effectiveness of the insecticide. All of these things are important to the outcome of the program and should have the appropriate amount of time and attention given to them.

Application Monitoring

The contractor will not work on the program without State personnel acting as advisor, time-keepers, overseers and block markers. Weather conditions are checked at local flight services and by local weather forecasts. The decision of whether conditions are acceptable for application are made by DDA personnel. The contractor can decline to fly if some condition with the equipment, visibility, hazards or his personal physical condition dictates that he shouldn't fly. The contractor cannot change the decision and fly when the DDA says conditions are not acceptable. DDA personnel also monitor the mixing and loading as well as contract compliance. The pilot is responsible for the quantity of material in each load and should not attempt to exceed the capacity of the equipment.

The primary means of application monitoring is with the use of aerial spotter planes and the use of spray deposit cards. These are placed in treatment areas, in buffer zones and in exclusion areas to monitor droplet size distribution drift and treatment outside the designated area. Aircraft that are equipped with cumulative spray time clocks or stop watches provide an additional check on maintaining a constant application rate.

Environmental Monitoring

All field personnel working on the project are advised to be observant for signs of any adverse environmental effects. Residents from the treatment areas are usually quick to call the proper State officials if they become aware of any damage or unpleasant situations.

Increased in the field daily observations will be made in April for initial hatch and then for progression of hatch in estimated percentage. At the same time observations are being made on foliage expansion and leaf development of important food species. Increased monitoring will improve the timing of spraying within areas of the proposed treatment area, a concern documented in the Scoping Activities section.

The ideal spray time is when hatch is complete and leaf development has progressed to 1/2 of full expansion. Systematic pre- and post-treatment larval population monitoring of all treatment areas is not possible with the manpower currently available. Observations are made by a monitoring team after spraying in about one-fourth of the treatment areas to ensure that we are getting larval kill, and attempts will be made to gather statistically significant quantitative data. Considering the past year's experience with this material, extensive quantitative monitoring is necessary to document the performance of the B.t. in light of the perceived inconsistency of its effectiveness, as stated in the Scoping Activities section of this report.

DDA personnel working on the program or the monitoring teams will make an onsite inspection when a complaint is received. If additional work is required, samples are taken for future analysis and the product company representative is contacted. If the damages are substantiated and are a result of improper application, the application company representative is also contacted.

Monitoring of environmental constraints is nearly all a process of application monitoring using spray cards and looking for droplets on surfaces where they are readily visible. Other sections in DDA and sister agencies are contacted if the report of any environmental damage relating to the project needs intensive investigation.

After the entire spray program is completed, all the treatment areas are checked for foliage protection by aerial observation and by infrared photography.

Some of the areas are visited at peak defoliation to verify the aerial survey. A percentage of the treatment areas are visited in the fall for egg mass surveys.

STATE OF MARYLAND, DEPARTMENT OF AGRICULTURE
COOPERATIVE GYPSY MOTH SUPPRESSION PROJECT--1985

INTRODUCTION

Gypsy Moth Status

The gypsy moth is becoming distributed throughout the State of Maryland. All life stages are present in each county, however, the largest populations generally are located in the Northern counties bordering the State of Pennsylvania. Since 1969, when the gypsy moth first was detected in Maryland, populations have continued to increase in certain areas. It was not until 1980 that the first tree defoliation occurred on 4 acres. In 1981, defoliation by gypsy moths occurred to trees on 8,826 acres. Based on extensive surveys, it was estimated that up to 60,000 acres would be defoliated in 1982 unless a cooperative suppression program was conducted. Although 48,360 acres in seven counties were treated with one of three insecticides, defoliation occurred on about 9,200 acres during 1982.

Surveys during 1982-1983 indicated that up to 130,000 acres of trees could be defoliated in 1983. A cooperative suppression program involving 11 counties and the application of insecticides to about 120,000 acres was conducted in 1983. Still, tree defoliation occurred on about 15,870 acres. New areas of significant infestations developed during 1983 in three counties on the Eastern Shore, where population increases occurred in areas adjacent to the Delaware border, and in Allegany County, primarily areas near the Pennsylvania border. Qualifying areas in these counties were included among the approximately 110,000 acres of cooperative suppression conducted in 1984. Outbreaks continue to grow in these and other areas and some 41,824 acres were defoliated statewide in 1984 (see Figure 1).

Despite some decline in gypsy moth populations in northern Cecil and Harford counties, (the first areas of the state to be generally infested by the mid 1970's) population outbreaks continue to be strong in the Mason-Dixon counties from Baltimore through Allegany and in the northern Eastern Shore. Accordingly, qualifying sites in these areas will be included among the approximately 120,000 acres of proposed cooperative suppression in 15 counties and Baltimore City in 1985. The program will emphasize protection of residential recreational and other valuable managed forested areas from Frederick to Frostburg. Gypsy moth populations well in excess of 1000 egg masses per acre occur on over 100,000 acres of oak dominated ridges in this area. New jurisdictions requiring protection for the first time are Garrett and Prince George's counties.

Purpose and Need for Action

The gypsy moth is a quarantine insect, regulated by a State and a federal quarantine. This Department has the authority, and the responsibility, to take actions that will regulate the distribution and the effects of the quarantined pest. In addition to regulating the artificial movement, intrastate and interstate, the Department needs to implement control or

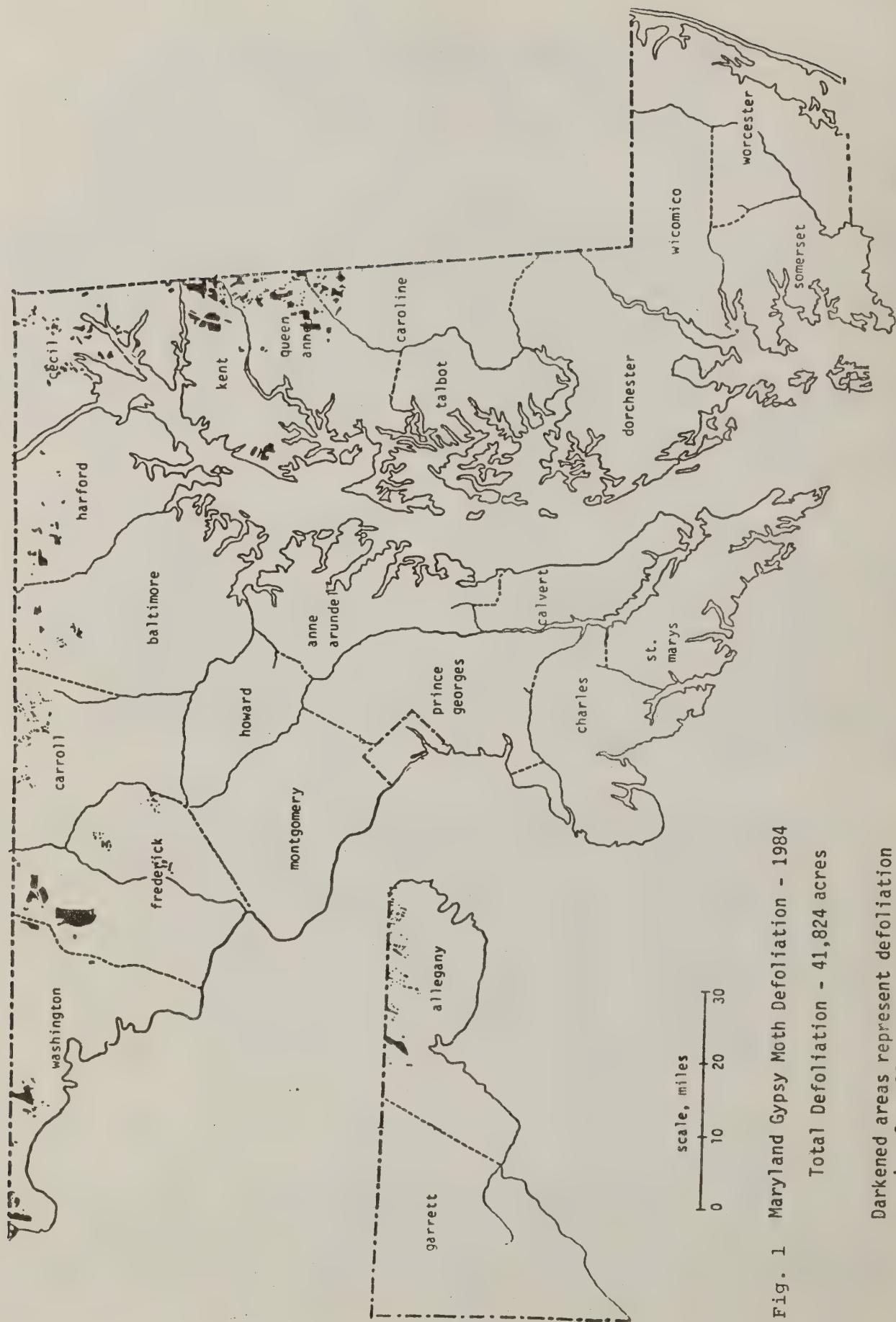


Fig. 1 Maryland Gypsy Moth Defoliation - 1984
Total Defoliation - 41,824 acres

Darkened areas represent defoliation ranging from 30-100%.

management activities that will effectively assist in enforcement of the quarantines.

Maryland is a densely populated state with a strong agricultural component, yet forested areas are present in all jurisdictions. Primarily because of this and for the reasons below, Maryland's forest and shade tree resources are very valuable and are heavily used and enjoyed by its citizens. Although there has been a recent increase in high volume wooded residential developments, the majority of the larger wooded tracts continue to be utilized for a wide scope of recreational activities by a large cross section of the local and regional populations. Maryland also has strong commercial woodland management programs. The State of Maryland, with the Maryland Department of Agriculture as the lead agency, is dedicated to preserving these forested habitats from damage by the gypsy moth and to enforcing inter and intra state quarantines to further protect areas not currently threatened with defoliation.

The cooperative suppression program is the most effective management tool available to deal with outbreak (defoliating) populations of the gypsy moth. The cooperative suppression programs conducted in 1983 and 1984 in Maryland have been over 98% effective in protecting trees from defoliation and damage and have minimized the spread of gypsy moths to other areas in Maryland and to areas south and west of Maryland. Surveys conducted by the Department have been very accurate in regards to predicting areas of defoliation and for selecting where suppression activities should be conducted. In many areas where defoliation has occurred for only 1 or 2 years, Maryland is experiencing oak mortality in excess of 35%. The hot, dry periods during the time that defoliated trees were attempting to refoliate had a major adverse impact on the survival of the trees. It is our opinion that gypsy moth defoliation of trees in the Mid-Atlantic and Southern states will be more damaging to trees than defoliation that occurs to trees in the Northeastern states, primarily because of the higher temperatures that often occur during the period when refoliation would be taking place. Residents of counties where gypsy moth infestations occur are knowledgeable about the insect and urge the counties to conduct or participate in activities that will reduce the damage done to landscape and forest trees and will reduce the rate of spread of the infestations to other areas. The objectives of the program are described in a following section and provide insight into the need for a cooperative suppression program.

The suppression programs conducted in Maryland have been very cost effective. Nonetheless, characteristic of first-time gypsy moth outbreaks, the pest pressure continues to be high and there is an urgent need to implement a suppression program in certain areas during 1985 to prevent defoliation of over 150,000 acres. We strongly feel that a cooperative suppression program is essential to managing the gypsy moth in Maryland and to being able to protect and preserve Maryland's highly valuable forest and shade tree resources.

PROPOSED PROJECT

Project Statement

In 1985, the Maryland Department of Agriculture, in accordance with the Gypsy Moth Suppression and Eradication Projects Final Environmental Impact Statement as supplemented, 1985 (Gypsy Moth FEIS-85) proposes to use biological and chemical insecticides augmented by natural controls to suppress gypsy moth populations on approximately 120,000 acres of State and private land. The project will involve insecticide treatment in the counties of Allegany, Anne Arundel, Baltimore, Caroline, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Kent, Montgomery, Prince George's, Queen Anne's and Washington, and the city of Baltimore. This discussion includes insecticide treatments in Prince George's County and Anne Arundel County to be performed as part of the Maryland Integrated Pest Management Pilot Project.

Organization

The lead agency within the State of Maryland for gypsy moth pest management activities is the Maryland Department of Agriculture, Office of Plant Industries and Pest Management. Within this Office, the Gypsy Moth Section supervised by Robert H. Tichenor, Jr. manages the gypsy moth suppression project. The responsible official is Dr. Charles W. Puffinberger, Assistant Secretary, Office of Plant Industries and Pest Management. Further information regarding the 1984 Maryland gypsy moth suppression project can be obtained by contacting Mr. Robert H. Tichenor, Jr., Maryland Department of Agriculture, Gypsy Moth Section, 50 Harry S. Truman Parkway, Annapolis, MD 21401.

Aid and assistance of various kinds is provided by other agencies, the most significant of which are the Maryland Cooperative Extension Service and the Maryland Forest, Park and Wildlife Service. The Extension Service personnel act as liaison between the general public and the Department by handling telephone calls, arranging public meetings, and dispensing literature and other information. The Maryland Forest, Park and Wildlife Service assists in providing additional manpower during application for block marking and observation; general forestry expertise; and additional public contacts.

The Maryland Department of Agriculture will conduct this proposed project under authority granted to the Secretary of Agriculture in Title 5, Subtitle 3, Section 5-301 through 5-313 of the Plant Pest Control Law, Annotated Code of Maryland.

Objectives

The primary objective of the suppression project is to prevent severe defoliation leading to tree refoliation. The secondary objective is to reduce gypsy moth populations, so that retreatment will not be necessary for one or more years. The exact percentage of population reduction necessary to achieve these objectives depends, of course, on the size and quality of the initial population, the quality and quantity of foliage present, and the amount and types of natural controls present. The techniques of determining whether or

not objectives are being met will be defoliation surveys, egg mass counts, and larval/pupal estimates. These are described in the "biological monitoring" section.

Biological Monitoring

The degree of success in achieving the primary objective will be measured by aerial defoliation surveys. In 1985, Maryland will again participate in a Forest Service sponsored high altitude optical bar color infra-red photography mission. This mission is planned to coincide with peak defoliation in Maryland and will cover the entire state. Photo interpretation and mapping and measurement of defoliated areas will be accomplished by specifically trained personnel from the Gypsy Moth Section. Mapped defoliated areas will be overlaid to mapped treatment areas to measure the degree of defoliation within treatment blocks. All defoliation will be reported as moderate (33-67%) or severe (67-100%). Any defoliated region not previously confirmed to be the result of gypsy moth larval feeding will be visited by local Gypsy Moth Section field personnel to determine the cause of the defoliation or damage. This will therefore, also be a principal method for documenting other forest insect and disease problems in the state.

As a supplement to this project and as back-up to the possibility of photo mission failure,, the Maryland Gypsy Moth Section will plan aerial sketch mapping of selected areas in conformance with forest service guidelines. The extent of sketch mapping attempted will depend in part on the degree of success of the high altitude photo mission.

Post treatment egg mass surveys are conducted in all treatment blocks to determine the need for treatment in the next year and thus to evaluate the degree of success of achieving the secondary objective. Comparisons will be made to a limit number of areas of various populations that received no insecticide treatment, as a partial evaluation of population trend in the absence of intervention.

Surveys will be conducted as for the pre-treatment egg mass count using the methodology described in the section titled "Treatment Area-Selection Criteria". The same number and location of survey sites will be used and, if feasible, the same personnel and the exact sample points will be utilized. Blocks or treatment parts thereof with average post-treatment gypsy moth populations measuring more than 250 egg masses per acre will be considered for treatment in the next season, using the selection criteria below.

A qualitative assessment of the direct efficacy of the control agents will be made by utilizing observations of larval abundance. The methodologies to be used in order of preference are: five-minute walks; larval traps (at least 10 trees in a cluster or transect); twenty-four hour frass trap collections (average of 5 lsq. meter traps per site). Comparisons will be made to untreated areas of similar habitat having high gypsy moth populations.

Actual survey(s) to be done will be left to the judgement of the supervising Regional Field Entomologist. Generally, only major areas or treatment blocks of special interest will be observed for larval abundance.

Treatment Area

Location-Approximately 60% of the proposed treatment area will take place in the Ridge and Valley areas of the northwestern counties of Allegany (30,000 ac.), Garrett (1,500 ac.), Washington (16,000 ac.) and Frederick (20,000 ac.). Some 20% will take place in the Piedmont-dominated east northern-tier counties of Cecil (3,500 ac.), Harford (1,500 ac.), Baltimore (4,500 ac.), Carroll (7,000 ac.), Howard (25 ac.) and eastern Frederick (5,000 ac. in addition to above). The remainder will take place in the mostly suburbanized counties of Anne Arundel (1400 ac.), Prince Georges (900 ac.), Montgomery (1000 ac.), Southern Baltimore and Baltimore City (1,000 ac.), Southern Cecil (12,000 ac.) and in the upper Eastern Shore counties of Kent (3,000), Queen Annes (5,000 ac.), and Caroline (5,000 ac.). See Figure 2 for a depiction of the relative size and distribution of proposed 1985 treatment areas in Maryland. The above acreages include some 1,600 acres of B.t. application proposed under the Maryland Gypsy Moth Integrated Pest Management Pilot Project conducted in Prince George's and Anne Arundel counties.

Selection Criteria-Three primary parameters are used to derive an overall rating of a potential treatment area for purposes of selecting it for inclusion in the Cooperative Suppression program. These criteria and their relative weighted value are:

- a. Human resident population density (40%)
- b. Gypsy moth population density (40%)
- c. Habitat suitability for gypsy moth (20%)

A rating of 1 (low), 2 (medium) or 3 (high) is given for each parameter as follows:

	<u>Rating</u>
a. Human population density	
> 1 domicile/10 AC to 1 domicile/25 AC	1
1 domicile/2 AC to 1 domicile/10 AC	2
> 1 domicile/2 AC	3
b. Gypsy moth population density	
< 250 em/ac	0
250 em/ac to 1,000 em/ac	2
> 1,000 em/ac	3
c. Habitat suitability	
< 75% favored host trees and structural features not present	1
either < 75% favored host trees with structural features present or	
> 75% host trees, but structural features absent	2
> 75% favored host trees with structural features present	3

Structural features are those described by Houston and Valentine (Stand Susceptibility to Gypsy Moth Defoliation in Hazard-Rating Systems in forest insect pest management:symposium proceedings USDA Gen Tech Rept WO-27, 1981 as correlated with potential for gypsy moth outbreak. Favored host trees are

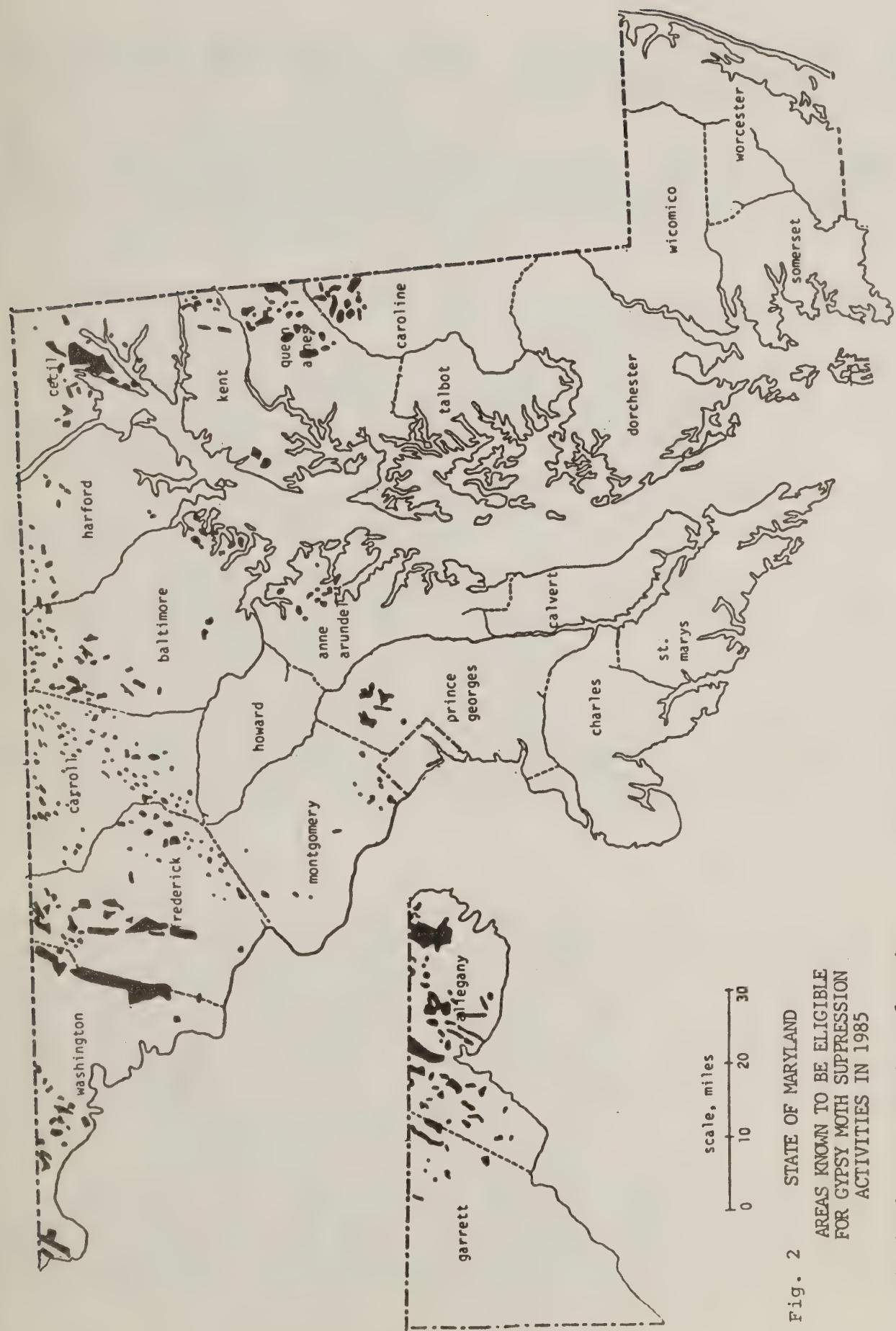


Fig. 2 STATE OF MARYLAND
AREAS KNOWN TO BE ELIGIBLE
FOR GYPSY MOTH SUPPRESSION
ACTIVITIES IN 1985

(marks denote approximate locations;
boundaries not necessarily drawn to
scale)

those listed as such in USDA F.S. Handbook titled "Gypsy Moth Host Preference". In practice, rating for this criterion is by the qualitative judgement of the experienced rater.

The rating is multiplied by the weighted percent for each criteria. The three criteria are added together to give an overall priority rating of 1.4 to 3.0. Initial consideration of what areas will be included in the years' program is based on the number of acres in each ranking and the limits of program capabilities.

Areas having any of the following characteristics are generally not considered for selection:

1. Less than 250 em/ac
2. Less than 50% preferred host trees (esp. with a high % of nonpreferred species present)
3. Less than 50% canopy in summer as seen from the air
4. No human habitation, use, or planned management
5. Property owners requesting exclusion
6. Size clearly less than 25 acres
7. Any reason to preclude the use of all pesticides or aircraft.

Special circumstances of an area such as its proximity to selected treatment areas, or areas whose high gypsy moth populations imminently threaten nearby areas where control is greatly desired, may extend consideration of treatment to that area on a case-by-case basis, even though it may not meet minimum criteria, or have selection priority. Once priority areas are identified, block consolidation or expansion will be attempted in the interests of program efficacy and efficiency in so far as program limitations allow and this does not detract from doing other separate priority areas. Examples of additional prioritizing include areas where unusually high tree mortality is expected or a site that has some historical or landmark significance.

Treatment Selection

Treatment type-Three insecticides, diflubenzuron, Bacillus thuringiensis and carbaryl, have been chosen for suppression activities. Diflubenzuron in the 25% wettable powder formulation, (Dimilin (R) W-25) will be applied at the rate of 35.03 grams per hectare (0.031 lb. per acre) of active ingredient in 7.02 or 9.35 liters of water per hectare (0.75 or 1.0 gallon per acre). Bacillus thuringiensis formulated any one of various commercial liquid products will be applied at the strength of 30 billion international units (BIU's) per hectare (12 BIU's per acre) mixed with water to a finished volume of 7.02 or 9.35 liters per hectare (0.75 or 1.0 gallon per acre). Carbaryl in the form of the liquid microfine suspension Sevin XLR-plus (R) will be applied at the rate of 1.12 kg per hectare (1.0 lb per acre) mixed with water in a finished volume of 7.02 liters per hectare (0.75 gallon per acre). A commercial spreader-sticker, Plyac (R) will be mixed into the stated finished volumes of Bacillus thuringiensis at the rate of 2% of volume. Approximate acreages to be sprayed in 1985 with each material are: diflubenzuron, 88,000 acres; Bacillus thuringiensis, 30,000 acres; carbaryl, 2,000 acres.

Treatment Selection Criteria-The pesticide selection process for determining the best material available to accomplish the objective of the program will be based on details of the specific areas. Several criteria will be used to evaluate the pesticides under consideration, including 1) the material must be registered by the E.P.A. and the State Chemist Office of the MDA; 2) the method of application must conform with label specifications; 3) the habitat where it is intended to be used must not conflict with any label restrictions; 4) competitive comparison of biological efficacy, environmental effects and economic feasibility. The three insecticides above best satisfy these criteria.

The criteria used to select which of these three insecticides will be used on a particular site are: 1) the presence of a habitat feature (such as exposed aquatic habitat or dense human populations) which will conflict with a label restriction; 2) the presence of rare or endangered species or other such critical and sensitive environmental entities, 3) the density and vigor of the gypsy moth population, 4) the presence of numerous bee colonies, 5) consideration of operational logistics and 6) economic considerations.

Specifically Bacillus thuringiensis (B. t.) is recommended for use except where gypsy moth populations exceed 1000 to 5000 egg masses per acre and are otherwise healthy and/or relatively less valuable forested tracts are involved. In these cases diflubenzuron is recommended except where label restrictions apply, such as a density of human domiciles greater than one per 10 acres or aerially exposed aquatic habitats. Where gypsy moth and human populations are high, Carbaryl is recommended except areas characterized by open water habitats or an abundance of apiaries.

Overlap in satisfaction of these criteria allow logistical adjustments to improve operational efficiency. The addition of a spreader-sticker to the B. t. is dictated by the prediction of a probability of rain within the next 48 hours (sticker is added) or the presence of numerous automobiles in the treatment block which may receive deposition of spray (sticker is not added unless rain is predicted).

Method of Treatment

In 1984, all insecticides applied under the Cooperative Suppression Program in Maryland will be applied aerially by properly licensed firms using only pilots experienced in forest pesticide application. Application will be done using only well maintained aircraft kept in first rate operating condition and having a spray system with new nozzle tips, diaphragms and other high wear or nonmetallic parts. Aircraft used will range in size from a Bell 47G helicopter to a DC-3. FAA rules for aircraft operation and minimum aircraft requirements for operating in congested areas and other restricting guidelines will be strictly adhearded to.

Calibration of all aircraft will be done on site by MDA personnel under guidance from U.S. Forest Service, FIDM personnel. Acreage sprayed as calculated from maps and amount of material sprayed out will be constantly monitored at each active airport and heliport. Direct observation of spray pattern and deposition will be made from the air and the ground using spray cards and other indicators.

Safety Considerations:

A detailed safety plan is part of the Project Work Plan. The following is a brief summary of the safety measures specified in it.

A loaded aircraft operating over or near residences represents the greatest hazard in the operation. Consequently, the contract will emphasize the importance of maintaining aircraft in top operating condition. Inspections of aircraft will be made regularly. Minimum qualifications of pilots are required. In the 1985 project, all aircraft operating in all areas which are residential to any degree will be either rotary-winged or twin-engine types. The contractor will be responsible for safety during the storage, mixing, and handling of insecticides.

An inspector from the Pesticide Applicators Law Section, MDA, may be present to see that all necessary handling precautions are observed. The State Inspector will also check all tanks, hoses, valves, fittings, pumps, and filter systems before they are used. He will enforce the use of personal safety devices deemed necessary for the insecticide involved, such as goggles, gloves, etc. He will monitor mixing and take samples from the tank for analysis to assure that mixing is done properly. Also, he will be present to act as liaison and technical expert in the unlikely event of an insecticide spill. Should an insecticide related problem arise, the following will be the line of authority:

1. Insecticide label
2. MDA Inspector
3. MDA Operation Supervisor
4. Gypsy moth control Airport Officer (AO)
5. Contractor's representative.

The contractor will be responsible for having general safety equipment, such as first aid kits, eye wash bottles, and fire extinguishers present at the loading site. The Maryland Department of Agriculture will also have this equipment available at the mixing/loading sites. The gypsy moth control AO will check each day to see that other parties are carrying out their safety obligations. Before the beginning of the project the safety plan will be explained to all employees. Emergency telephone numbers will be given all participating personnel and posted.

Benefit/Cost Analysis

Recently, specific reports on per acre losses to forest land due to gypsy moth have been made by New Jersey and Pennsylvania. The lowest values of losses reported in any of these studies give cost:benefit ratios in the range 1:1.7 to 1:3.3, based on expected 1984 Maryland Program per acre cost ranges of \$5.25 to \$10.00/ac. Other values for forest land ranged higher and would give cost:benefit ratios in excess of 1:10 and some above 1:50.

A 1985 estimate by the Maryland Department of Natural Resources based on current market value places a loss value of \$300.00 per acre for a salvaged stand as compared to controlled harvest for wood products in the Maryland Ridge and valley area. This is compared with a current one time cost of spraying of \$7-8/acre. Thus, in Maryland, except for unusual circumstances,

it is expected that any application to any forest land will have a potential cost:benefit ratio in excess of 1:2 for that application. Of course, landscape or specimen trees on residential property have considerable value and cost:benefit ratios would commonly exceed 1:100, and would range considerably higher.

Scoping Activities

The Maryland Department of Agriculture emphasizes an ongoing dialogue and relationship with public and private organizations, public agencies and officials, concerned individuals and the general public in treatment site areas to compliment or formal scoping process. The Department requires County contacts in affected areas and also have a formal agreement with the Cooperative Extension Service whereby local Agriculture Extension Agents act as local public contacts concerning our Gypsy Moth Section activities. Local questions and concerns are either directly answered by the agent or the caller is referred to the Regional Survey & Control Offices or the Main Section Office in Annapolis.

In all treatment site areas, a public meeting is held or an "open house" arranged where the reasons, approach and methods of the Suppression Program are presented along with details of the proposed treatment plans for that specific area. The public is invited to these events through direct solicitation in the notification process and frequently through general public radio and newspaper advertisement.

The Department periodically releases news articles concerning upcoming activities, updates of this gypsy moth problem, etc. Although not directly soliciting input regarding issues and concerns, this is the single action which generates the greatest public response from the treatment site areas.

Formal scoping in FY/82 and FY/83 consisted of a site Specific Scoping Session. However, attendance at such meetings was very low and there was participation by only a minority of those attending despite 250+ direct invitations and a great deal of advance notice. Perceiving the inconvenience of travel and the difficulty of preparing a second package of information for those who could not attend, in FY/84 and FY/85, the Department developed a "Scoping Letter" which could be sent out to all potentially concerned entities. This letter, along with a map of all proposed spray areas, was sent to the following:

- a. Environmentally concerned organizations, groups or individuals
- b. State Delegates and Senators from affected areas
- c. County Extension Offices
- d. Relevant State Agencies
- e. County Governments in affected areas
- f. School districts in affected areas
- g. Local representatives of relevant Federal Agencies
- h. Local Health Departments
- i. Other "concerned" entities.

This publication contains the salient features concerning the reasons for, approach, and methods of conducting the Cooperative Gypsy Moth Suppression Program including details comprising the means by which a safe, effective, application of insecticide is accomplished. The mailing list has

been expanded by approximately 40% (over 350) and response at any time of the year is emphasized. The letter is mailed in March in order to contain specifics regarding treatments proposed for the upcoming season. Responses regarding new issues and concerns relevant to the specific plans for the current season's program are requested by two to three weeks prior to the expected start of the Project.

During the past year, no new issues or concerns were raised by this process and only 5 responses were received. However, during the 1984 spray season, a new issue was encountered. This concerned residential areas where it was the conventional practice of parents to keep their children up by the dwelling while waiting for a school bus rather than down by the road or at a designated pick-up point. This made determination of whether pickups would take place or observation of school children in the treatment area from the air or ground extremely difficult. In meetings with the local board of education, it was decided that details of the bus schedule would be provided to us. This will be coupled with procedures by which the pickup schedule would be strictly adhered to so that application could be scheduled outside the time window during which pickups would be accomplished at any particular treatment site.

A brief review of the five responses received follows. One was from a State agency supporting the program and requesting background information references for the pesticides (this has been forwarded). The second was from the Washington Suburban Sanitary Commission, also expressing support and requested advance notice of any activities near the Triadelphia Reservoir (there were none in 1984 and none near in 1985 plans). The third was from a County Extension Agent expressing concern that the project did not offer enough control to enough areas in her county (no response required). The fourth was from an individual expressing general opposition to all pesticides due to general ineffectiveness and potential to indirectly contribute to the degradation of the Chesapeake Bay, and requested that no spraying activities occur at her residence. This request was noted and filed although no control activities have occurred or are planned for her community. The last response was from the Chesapeake Bay Foundation. This expressed specific concerns about the toxic effects of carbaryl on aquatic and terrestrial invertebrates, and especially to bees, possible secondary impacts on avian predators, and the possibility of human carcinogenicity. These concerns were all covered in the 1984 USDA Gypsy Moth Final Environmental Impact Statement, and the author has been referred to the appropriate sections of that document. The letter additionally refers to concerns about the toxicity of diflubenzuron to aquatic invertebrates and the suspected carcinogenicity of p-chloroaniline, an "active ingredient". This compound is actually a relatively short-lived intermediate in a degradation pathway of diflubenzuron by fungi and is completely metabolized-(Seufeler, S.L., H.D. Braymer, and J.J. Dunn, 1979. Pest Biochem and Physiol. 10: 174-180). The letter ends with a suggestion that the use of these pesticides be considered for exclusion from areas "adjacent to estuarine water bodies, sensitive freshwater habitats (e.g. hardwood swamps) and human populations". Avoidance of bodies of water and all but sparse human populations are of course label requirements and are strictly adhered to. Furthermore, in cases where a large Dimilin block is potentially adjacent to a body of water, buffer blocks at least 500 ft. wide are placed in between Dimilin sprayed areas and the water where B.t. is substituted (for example, next to the Elk River on the Elk Neck Peninsula and around the Rocky Gap Lake, Allegany County). The letter ends by suggesting that we restrict

the use of these two pesticides "in certain locations" and that B.t. be considered for use in those sensitive areas. This is, infact, our policy as stated in the section "Treatment Selection Criteria" in the 1982, 1983, 1984 and 1985 Maryland Environmental Assessments.

There were still two major areas of traditonal concern brought up during the general scoping process. One was in the area of concern for public health and environmental welfare through the use of any of the proposed insecticides.

The other encompassed concern about the general inability of the Project to prevent the natural spread of the gypsy moth, or to address all areas of potential damage or to be able to prevent outbreaks in any area. Although all these issues have been thoroughly addressed previously, there is a continuing need to efficiently convey information in these areas to the general public. In an effort to get information more directly to those with such concerns about the use of chemical and biological pesticides, the Maryland Cooperative Extension Service has developed a publication giving information about the efficacy, as well as, health and environmental risks associated with all the insecticides registered for use against gypsy moth. In one area of high human population, the Gypsy Moth Section agreed to a county government request to conduct a public meeting to address this subject area. Unfortunately, in response to decreased intensity of gypsy moth outbreaks in this specific area, the use of chemical pesticides was correspondingly decreased in the proposed 1985 Project and the meeting was post-poned due to lack of public interest. See the sections of the Maryland Environmental Assessment entitled Precautionary Constraints and Public Notification for further details concerning public notification and applicaiton safety methods.

The second general area of concern lies outside the scope intent and abilities of the Cooperative Suppression Project. Those wishing to conduct their own Gypsy Moth Control are referred to a lst of qualified aerial application or to other control information supplied by the Cooperative Extension Service (CES). Those wishing to attempt to prevent gypsy moth outbreaks are referred to recent Agriculture Research Service test results regarding controls aimed at low level populations. In one county a Cooperative Extension Service handout has been developed outlining the available information in this area. Other inquiries are referred to the selection criteria used to choose areas most in need of treatment when resource limits of the Cooperative Suppression Project are unable to address all threatened areas (see Selection Criteria, above). A handout outlining the need for, approach, selection criteria, methods, and efficacy of the State supervised Cooperative Gypsy Moth Suppression Project was developed by the Department and was made available to the general public through distribution at the State Fair and other public meetings and in response to general inquiries.

AFFECTED ENVIRONMENT

Host Vegetation

Forest land in Maryland comprises approximately 45% (over 2.7 million acres) land cover varying from as low as 30% in two predominantly agricultural counties to 70% in the two most western counties. With the exception of some Eastern Shore counties, the major forest type is oak-dominated hardwoods. This forest type is typically 40-60% of all forest in these areas, and is in total about 50% of all forest land in the State. Oaks are also a frequent component of other less common forest types including oak-gum and oak-pine. Much of the

coastal plain soil types are light and ridge features are also well drained. Oaks are commonly as much as 75% or more of the tree species in these situations. This combination makes for the most susceptible and vulnerable habitat for gypsy moth outbreaks.

Potential treatment sites (Human population distribution)

Potential treatment sites vary from urban/suburban situations to sparsely inhabited/recreational ridge features. Uninhabited forest sites seldom exist as even recreational sites typically include some adjacent residential properties. Less than 5% of the program may be classified as congested residential properties. These are older established neighborhoods with mature oaks large enough so that the landscape is dominated by the tree canopy. Some 50-60% of the program is servicing sites that range from sparsely populated rural settings to small developments not associated with cities or towns. Most are small to moderate sized blocks less than 250 acres (100 ha.) in size with less than one domicile/ac. The remaining 40% of the program is sparsely populated forested tracts where a few residences are in association with various recreational entities. These treatment sites are almost exclusively in the ridge and valley province of the state.

It is estimated that a total of 30,000 individuals reside within Project spray blocks across the State, but fully 74% or over 22,000 of these reside in areas sprayed by B.t. and 22% reside in the areas scheduled for Dimilin application. This reflects the rural/forested or recreational nature of the vast majority of the Project acreage which comprises the Dimilin acreage. Three limited areas are proposed to be treated with Carbaryl in 1985, two on the eastern shore and one in the central piedmont county of Carroll. It is estimated that less than 1,300 people live in these sites. This gives an average of 0.57 people/acre. An average 0.75/ac. is the density of people in the B.t.-treated areas and there are 40 acres per house or only 0.07 people per acre in areas where Dimilin is proposed. The average human density by area for chemical insecticide sites ranges from .64/ac for carbaryl in Carroll County to 0.04/ac for Dimilin in Allegany County.

Non-target Organisms

Since this program is dominated by relatively low to moderate density human population distribution and high-use recreational tracts, there is a healthy compliment of the common native and established animal and plant species present. With notable exceptions, this program purposely addresses sites featuring human presence and influence and there are not typically rare and endangered species present.

All areas can be presumed to have any of the normal domesticated animals and at least some of the eight introduced gypsy moth parasite species known to be established in Maryland.

Being divided into four physiographic regions, the Coastal Plain, the Piedmont, the Ridge and Valley, and the Allegheny Plateau, Maryland is great in diversity of flora and fauna. Treatment areas are found in all four of these physiographic regions.

Forested areas proposed for treatment in the Coastal Plain have a canopy dominated by Quercus sp. and Carya species. Other important canopy species are Nyssa sylvatica, Liquidambar styraciflua, Acer rubrum, and Betula species. Understory is characterized by: Magnolia virginiana, Clethra alnifolia, Cornus florida, Lindera benzoin and Smilax rotundifolia

Non-target organisms in these habitats of particular concern because of their uniqueness are as follows:

Insecta

Odonata

Gomphidae

Gomphus parvidens

Libellulidae

Tachopteryx thoreyi

Lepidoptera

Papilionidae

Papilio cresphontes cresphontes

Papilio palamedes

Nymphalidae

Speyeria idalia

Euphydryas phaeton phaeton

Nymphalis vau album

Forested areas proposed for treatment in the Piedmont also have a canopy dominated by Quercus sp. and Carya species. Other important canopy species are Fagus grandifolia, Liriodendron tulipifera, Acer rubrum, Vitis species. The understory is characterized by Lindera benzoin, Viburnum sp., Hamamelis virginiana, Prunus virginiana, and Cornus florida. Non-target organisms of particular concern due to their uniqueness are as follows:

Insecta

Coleoptera

Coccinellidae

Scymnus gordoni

Lepidoptera

Hesperiidae

Autochton cellus

Papilionidae

Papilio cresphontes cresphontes

Papilio palamedes

Nymphalidae

Speyeria idalia

Clossiana selene myrina

Euphydryas phaeton phaeton

Forested areas proposed for treatment in the Ridge and Valley region have a canopy dominated by Quercus sp. and Carya species. Other important canopy species are Fraxinus americana, Acer rubrum, Betula sp., and Vitis species. The understory is characterized by Cornus florida, Hamamelis virginiana, Ostrya sp. and Vaccinium species. Non-target organisms of particular concern in these habitats because of their uniqueness are as follows:

Insecta

Lepidoptera

Hesperiidae

Hesperia sassacus sassacus

Polites mystic

Amblyscirtes hegon

Papilionidae

Papilio cresphantes cresphantes

Lycaenidae

Celastrina ebenina

Nymphalidae

Speyeria idalia

Clossiana selene myrina

Euphydryas phaeton phaeton

Nymphalis vau album

Basilarchia arthemis arthemis

Aves

Laniidae

Lanius ludovicianus

Mammalia

Vespertilionidae

Myotis sodalis

Forested areas proposed for treatment in the Allegheny Plateau have a canopy dominated by Quercus sp. and Carya species. The understory is characterized by Cornus florida, Hamamelis virginiana, Vaccinium sp., Amelanchier sp. and Kalmia latifolia. Non-target organisms of particular concern because of their uniqueness are as follows:

Insecta

Lepidoptera

Nymphalidae

Speyeria idalia

Clossiana selene myrina

Nymphalis vau album

Basilarchia arthemis arthemis

Geography

Maryland is divided into four physiographic regions; the coastal plains, the Piedmont, the Ridge and Valley, and the Allegheny Plateau. Elevations increase moving westward across the Coastal Plain and Piedmont, reaching highest relief and elevation in the Allegheny Plateau.

The Coastal Plain is low and partially submerged with many islands and marshes. The Chesapeake Bay divides this region into an Eastern Shore which is nearly flat, sparsely populated and highly agricultural; and a Western Shore which is higher, more dissected, and mostly in residential or forestry uses. The region as a whole consists of a series of southeasterly dipping layers of unconsolidated sands and clays. Its streams are slow moving and winding, many becoming tidal estuaries before reaching the Bay. A small area drains directly into the Atlantic Ocean.

The Piedmont is a broad undulating land surface with low knobs and ridges. Numerous rather deep and narrow stream valleys have been incised into it; the streams are mostly small and show steep gradients. This region is a complex series of metamorphosed rocks including gneiss, slate, schist, and marble. The land is mostly in agricultural or residential uses.

The Ridge and Valley Region is divided into different divisions. The Blue Ridge Mountains are formed of the massive, resistant weverton quartzite and of weaker metamorphosed volcanic rocks like rhyolite and basalt. The Great Valley is a broad lowland with a gently rolling floor underlain by layers of limestone and shales. It is drained by Antietam and Conococheague Creeks which flow into the Potomac River. The Valley and Ridge is a series of northeasterly tending, massive sandstone-strata mountains and intervening valleys formed by erosion of weaker limestones and shales. The ridges are heavily forested and the valleys are primarily agricultural.

The Allegheny Plateau is a broad upland across which a series of ridges extend in a northeast-southwest direction. Elevations are near 3000 feet. The strata is made of shales, coal and sandstones and lies in broad folds. The surface is strongly dissected, with relief at a maximum. In places the valley walls are nearly vertical and stream gradients are steep with rocky beds. Most of the streams drain into the Potomac River, but the extreme western ones drain into the Ohio River system. The land is mostly in forestry or agricultural uses.

The climate of Maryland varies from west to east. The average temperatures are 48 degrees F. in the most western corner of Maryland to 58 degrees in the southeastern corner. The average number of days per year with temperatures below freezing ranges from more than 150 days on the Allegheny Plateau to less than 70 days along the southern reaches of the Chesapeake Bay. The average annual rainfall in Maryland ranges from 48 inches to 36 inches. The precipitation is rather uniformly distributed throughout the year, although the heaviest rains occur in the summer months. During most months the precipitation ranges between 2 to 4 inches, but droughts, hurricanes, and summer storms cause considerable variation in monthly averages.

Most of the State drains into the Chesapeake Bay, although a small portion of Garrett County drains into the Gulf of Mexico via the Ohio River System. The major metropolitan areas derive their drinking water from either the Susquehanna or Potomac Rivers and from a series of reservoirs on small rivers in the Piedmont area.

ENVIRONMENTAL CONSEQUENCES

Beneficial Effects

The main direct effects of implementing the proposed project are reduced gypsy moth larval populations and reduced defoliation to trees and shrubs. By protecting the foliage, there will be less stress on trees resulting in increased growth and less mortality.

In forested areas, this reduction of defoliation and mortality will prevent loss or damage to high value timber trees. The value of forest lands

for watersheds and recreational use will be preserved. In addition, food sources and cover vegetation for wildlife will be protected as nearly all wildlife leaves an area that is heavily defoliated. In general, the existing forest habitat will be preserved.

In wooded residential areas, gypsy moths damage trees and are a nuisance to humans. Landscape trees may lose their aesthetic and shade value, and die as a result of defoliation. Dead or dying trees become a safety hazard to humans or property and must be removed. Reduction of the larval populations will prevent the nuisance problem caused by numerous larvae present in and around homes, buildings, lawn, trees, shrubs, etc.

Another benefit of the suppression program is that larval population reduction decreases the dispersal of gypsy moths to other areas of Maryland, or to other states. This reduction also results in the need to spray smaller acreages for suppression the following year(s). If controls are not applied, unimpeded dispersal of the gypsy moth will require more and larger treatment areas located over a wider geographic area be sprayed the following year.

Adverse Effects-Proper implementation of the suppression project should produce little or no adverse effect on the environment. The insecticides to be used have been approved and registered by the EPA. They are safe and effective when applied according to label directions. General adverse characteristics of the insecticides to be used in this program are:

Diflubenzuron (Dimilin). This insect growth-regulator has been shown to have little effect on non-target species. Certain sensitive non-target aquatic crustaceans as well as aquatic insects may be affected. Effects to the aquatic environment are extremely variable and short-lived with populations of sensitive species recovering within a few days to a month.

Carbaryl. Carbaryl is a broad spectrum organocarbamate insecticide commonly known by the trade name Sevin. Application of Sevin may kill some non-target insects, however, the numbers involved are usually minor and there will be little effect on non-target populations. Sevin is toxic to honey bees but different formulations have different toxicity levels. The Sevin XLR-plus formulation is the formulation of Sevin least toxic to honeybees and will be used in this program.

Bacillus thuringiensis. B.t. has no adverse effect on birds, mammals, fish, or non-target insects, except certain lepidopterous larvae. Therefore, the material has been considered to be environmentally safe.

Specific environmental effects of the various insecticides registered for control of the gypsy moth have been discussed thoroughly in the Gypsy Moth Suppression and Eradication Projects Final Environmental Impact Statement as supplemented 1985 in the "Chemical Insecticides" subsection of the "Environmental Consequences" section and in Appendices D and F.

The proposed suppression program will not adversely affect any federally listed endangered or threatened species or their habitat. The presence of a threatened or endangered species in a treatment area would preclude treatment of that area with insecticides likely to affect them, and there are no such habitats within or near proposed treatment areas for any of the insecticides.

To avoid even remote risks to rare and endangered species that may be present, a local representative of the U.S. Fish and Wildlife Service as well as members of different agencies within the Maryland Department of Natural Resources are consulted about our proposed program. These consultants, having the best local knowledge of the habitats of species on the rare and endangered lists of both the U.S. and Maryland, are encouraged to suggest program modifications in the interest of any such species. To date such suggestions have been followed and written agreements reached. Private conservation organizations are also consulted, especially concerning particular landholdings in or near our proposed treatment areas. For instance, in 1983 the Maryland Chapter of the Nature Conservancy was consulted concerning an infestation in a newly acquired tract which included a unique undisturbed oak-ironwood swamp habitat. Other local Environmental and Conservation Organizations of various descriptions, with and without landholdings, are of course contacted directly through the scoping process.

To avoid killing honey bee colonies in the treatment area, the MDA will operate a coordinated notification effort with the aid of the Department's apiary inspectors. Gypsy Moth personnel are given lists of all apiary locations. These are compared to maps of all treatment areas and apiary inspectors will notify all beekeepers within 1 mile of these areas. The MDA will also have pollen traps available for any beekeepers that request them.

None of the specific species mentioned in the "non-target organisms" section is endangered although a few are categorized as "threatened" by some definitions. None have delimited or restricted habitats in just a few areas and the areas in which they are known to occur are not largely impacted by this project, as their specific environment. The meadows favored by the Nymphalids Speyeria idalia and Euphydryas phaeton and the wooded ravines of Erynnis persius are commonly found in many places throughout their range outside treatment blocks.

In many cases, the habitat of these uncommon insects is dictated by the presence of their favored food. Virtually all of the species listed for all the areas (excepting the aquatic Odonata Errinnis persuis which feeds on willow and poplar, and the predaceous Synmnus gordoni collected only from Silver Spring - not a treated area) feed on understory plants or transition (edge) plant species (for example, the violets fed on by Clossina seleve myrinha and the red bay, sweet bay and sassafras fed on by Popillio palamedes) which would not be directly impacted by the aerial application of these insecticides. In fact, it is possible that habitat conservation that occurs with the successful foliage protection offered by this project preserves the micro-climate conditions under which many of these species and their host plants survive.

The noise from low-flying aircraft can be expected to disturb the sleep of people. Fine droplets of spray material are deposited on all exposed outdoor surfaces and may affect automobiles, lawn furniture, etc.. Adequate notification of residents should reduce these effects.

Irreversible or Irretrievable Commitment of Resources

The manpower needed to complete a program of this size is great. Many factors influence the amount of loss incurred during the program. The amount of time an aircraft is on the ground affects the amount of time ground crews

remain idle. Weather conditions and maintenance problems are the major factors in keeping aircraft on the ground. Also, the time spent on this project that prevents other projects from being done is a loss to other government programs.

One of the major resources necessary for the success of a suppression program is petroleum products. These products are consumed in the form of vehicle fuel and aviation fuel. Gasoline is used mainly by vehicles going from the airport to the various spray blocks. Vehicles used by the applicator to bring insecticides and water when needed also consume gasoline. Amounts of aviation fuel is dependent on the number and type of aircraft used and the weight of the spray load.

The money expended for personnel, surveys, equipment, vehicle use, supplies and the purchase of chemicals used during the suppression program is a valuable resource. Improper application of chemicals can result in cost increases due to higher rates of application than calculated or in lost funds due to leftover chemical resulting from an insufficient application rate. A monetary loss can occur if biological insecticides become nonfunctional due to long-term storage. However, the likelihood of either of these events is low. By far, the greatest potential loss occurs if a program is planned and then aborted at some late date.

Human Health

Some three fourths of the population directly affected by this project are in areas treated with B.t.. This biological insecticide has been shown to be consistently safe in a variety of exposure regimes to test animals and human subjects, the only adverse effects documented during isolated (uncontrollable) accidental exposure to the concentrate. Therefore, it is highly unlikely there would be any human health hazard posed to the general human population with even the extensive use of these materials in gypsy moth suppression projects. (Gypsy Moth Suppression and Eradicatioan Projects FEIS as suppl. 1985 p. 68-72).

The second greatest amount of potential human exposure during the Maryland Gypsy Moth Suppression Project of 1985 will be to the insecticide Diflubenzuron. Due mainly to its mode of action, Diflubenzuron is considered to have low mammalian toxicity (Gypsy Moth Projects FEIS-85 p. 61) and is

furthermore found to be noncarcinogenic and nonmutagenic (ibid p. 64, p. F-12) but has been found to create elevated methemoglobin and sulfhemoglobin levels in chronic feeding studies with mice, although effects are apparently temporary (ibid p. F-10). The suggested allowed daily intake (ADI) of 1.1 mg/kg/day based on these studies will be used as the exposure comparison basis here as the lowest no effect level for any observed effects.

Exposure to the general public would be through (a) direct application, (b) indirect (indoors), (c) indirect (draft) or (d) oral ingestion of food items from sprayed areas. Given the application rate of .03 lb. a.i. of Diflubenzuron per acre and using the summary of Expected Duses on p.F-44 of the Gypsy Moth Projects FIES-85 worst case exposures from any of the routes are anywhere from 7,300 to 31,400 time less than the ADI. This is notably an acute exposure not chronic and since diflubenzuron has no labeled domestic

uses and only one agricultural use relevant to Maryland (soybeans) it would be acceptable to assume that this project would constitute the only exposure to Diflubenzuron for these individuals in this season. Occupation exposure although much greater is still realistically almost 1,000 times less than the ADI.

Since diflubenzuron is handled in the powder form and is delivered well before hard to stable loading/mixing sites, the only feasible avenue for accidental exposure would be via aircraft spills. Since Maryland will treat less than 90,000 acres with this insecticide and will use average loads some what higher than 300 gallons, the probability of an aircraft spill occurring at all of 0.17 for land and .019 for water from table 6 of the Gypsy Moth Projects FEIS-85, p. F-121 are probably high.

The only other insecticide used in the program, Carbaryl, is proposed for three limited areas and will directly involve less than 1,300 people. All these areas are rural, residential developments and the entire residential areas are being treated. Therefore, these 1,300 people wil be the great majority of all people in the vicinity of the applicatons. Therefore, direct exposure plus oral intake from food items of a total .0139 (ibid p. F44-45) mg/kg would be a maximum possible worst case exposure (the limited use of this chemical in the project would make the probability of picking up residues from many food items in the environment unlikely, especially in May). This is still over 7 times less than the acceptable daily intake.

Since there is limited use of this material, only two aircraft loads are expected between two of the areas are only 4 or 5 in the third area. Thus, occupational exposure would be quite limited compared to the scenairoes established in the Gypsy Moth Projects FEIS suppl. 85 which give realistic exposures of 46 times less than the ADI (p. F-124). It is furthermore expected there will be no common observer personnel between the third and other two areas. The insecticide will be packaged in convenient 5 gallon containers which will esliminate bulk handling and help reduce occupational exposure to mixers/loaders. Since there are such few aircraft loads and minimal transportation of insecticide accidental spill scenairoes would likewise be greatly overstated as they appear on page F-128.

ADMINISTRATIVE REQUIREMENTS AND CONSTRAINTS

Guidelines for local Participation

In Maryland, there is no basic contiguous unit of government smaller than a county with which to deal; therefore, the MDA will coordinate the suppression program with each affected county. Based on survey results obtained by MDA, the State will determine which infested sites meet the treatment selection criteria. This information will be forwarded to each county government with the indication that the State will coordinate and implement a cooperative suppression program in selected areas of the county if the county government and residents/property owners concur. During 1984, the county involvement will consist primarily of providing appropriate cost-share funds, providing public information, and supporting MDA when possible. No formal request to MDA for assistance is needed; however, a letter will be sent by MDA to each county indicating the financial obligation of that county in the

suppression program and asking for a response indicating commitment of those funds. If a county decides that a suppression program is not desirable, then MDA will have to determine the most appropriate action since the Maryland Plant Pest Control Law provides MDA with the authority to take regulatory and/or control actions.

It is a policy of the MDA not to conduct suppression activities for insect pests unless the affected county government is a participant. With gypsy moth, this participation has traditionally been in the form of cost-sharing of control actions and in the dissemination of information to local residents and property owners. The responsible county agency is determined by each county government and is different in each county.

Public Involvement

Public participation will be essential for implementation of the suppression program. Many residents of the areas proposed for treatment have contacted local, county, or state agencies expressing concerns and requesting assistance in controlling the gypsy moth. These requests have been forwarded to the State MDA for investigation and consideration. The State is willing to implement a suppression program in certain counties, but only if county and local residents are willing participants in the program.

The MDA conducts a public scoping for the purpose of providing the general public an opportunity to express their concerns or ask questions about the proposed program (See "Scoping Activities"). In addition, the public is invited to participate in regional or county meetings where details of the suppression program will be presented and discussed. State and county agency representatives will be present at these public meetings. Public relations and educational activities are coordinated among the appropriate State and county agencies. Efforts are made by the State to work closely with the local media to inform the public of the proposed program and to encourage their support and cooperation during the treatment phase. County agencies also cooperate with the local media. The Supervisor, Gypsy Moth Control (MDA), or his designee (usually the Regional Entomologist), are the State officials who participate in public meetings.

Primary responsibility for developing and implementing the suppression program, including determination of treatment sites, the insecticide to be applied, etc. belongs to MDA. However, the concurrence and support of the county government and residents in the treatment areas will be necessary before any treatments are made. New relevant issues or concerns raised during the scoping or public information process may result in changes being made in the area treated, type of insecticide used, application approach, etc.

Public Notification

Public information and public involvement are necessary to conduct a successful suppression program. The primary concern is to inform people in the designated treatment areas of the details regarding the proposed treatments. Each residence/property in proposed treatment areas and for at least 100 feet outside these blocks are mailed or hand delivered a notification. This notification gives a brief background as to the Program and the need for control; describes the application process and the conditions under which application will or will not occur and other related controls and constraints;

indicates which insecticide has been chosen and gives a brief description of its characteristics and effects; gives the block number as a reference and; invites attendance at a public meeting, gives sources for additional information, and a toll free telephone number which can be called to find out which blocks in that area have been treated on a given day and which block numbers are planned for treatment the next day and updates of other Project activities. The phone message is updated every afternoon (except on weekends when no application is planned).

Furthermore, this notification gives residents the opportunity to remove their property from the program by submitting that request in writing stating their reasons and including an accurate description of their property location. A response deadline is indicated and delivery of notifications are to be completed no less than four weeks prior to that date. In cases where residents are tenants, removal request is deferred to the owner. Where multidwelling units are involved, onsite management is notified in person and is given the responsibility of informing tenants of the program.

The public notification process is shared by State and local governments. The MDA, as State lead agency, will be responsible for and supervise notifying residents in the treatment area of the program. The Department will coordinate with other State agencies (Forest Services, Park Service, State Highway Administration, etc.) and the County Cooperative Extension Service in the public information process. Public information will include leaflets, local newspaper articles, radio spots, etc.. The Supervisor, Gypsy Moth Control in MDA or his designee, will be the primary State contact for public information.

The county Cooperative Extension Office is provided up-to-date county maps of treatment areas and this office is mentioned as the local public contact for more information. By previous agreement a particular agent within each county Office is designated as the gypsy moth contact.

Removal of the property of an objector is accompanied by at least a 100 foot buffer zone of no-spray area between it and the remainder of the proposed spray block, unless the property owner waives that provision. Thus, the accommodation of an objector usually results in other properties, previously notified of the State's intent to treat, being dropped if sufficient loss is achieved via objector(s). In this case a reasonable effort is made to inform the landowners so affected about the change in status. This is done usually by recording an announcement of changes which is available via the toll-free information number.

Nearby schools are notified of the proposed program. During the application phase, local police jurisdictions and state police barracks in the affected areas are notified of the proposed program and kept updated as to project progress. The local Federal Aviation Administration Official is informed of details of the impending aerial project.

Precautionary Measures and Constraints

It is important to impose rigid precautions and constraints in any aerial application of insecticides to insure that undesirable effects do not occur. These undesirable effects include, but are not limited to: (1) application of materials to water supplies, (2) application of materials to sensitive

environments, (3) spray drift outside of the target area, (4) inadequate foliage protection, (5) inadequate insect population reduction, (6) application of materials to the wrong area, (7) honey bee kill, (8) toxic effects on non-target organisms, (9) spraying humans, (10) damage to property from falling aircraft or parts thereof (11) insecticide spotting of automobiles, clothing or other articles outside the residences, and (12) the need for retreatment.

A scoping process is conducted in order to identify the concerns of the public. This is the local level of interaction in developing the precautions and constraints for this program. Public meetings are held in each participating county. The MDA Pesticide Applicators Law Section administers the State and Federal Laws concerning pesticide application, and this Section staff develop the necessary precautions and constraints for this suppression project. The insecticide label, developed by the manufacturer and approved by the EPA, contains many precautions and constraints that will be followed during use of the insecticide.

Application Constraints-The primary target of the insecticide application is the first three instars of the gypsy moth larvae. Application will be made when wind speeds of 2 to 10 miles per hour are present and when temperatures are below 80 degrees F, but warm enough for the insecticide to flow. The foliage must be dry with no threat of rain for 4 to 6 hours following application. Application will be timed so as to avoid spraying school children, picnickers, etc. No spraying will be done under thermal inversion conditions.

Applications will be made when oak leaf development is from bud-break to 2/3 maturity depending upon material. A representative sample of the treatment blocks in each region will be surveyed within 5 days before application to confirm egg hatch and presence of healthy larvae.

The aircraft speed, altitude, swath width, nozzle type and angle, etc. will depend on the type of aircraft utilized. The pilot will be briefed about each spray block. Spray blocks will be shown on a USGS 7.5 minute series topographic quadrangle map. The spray blocks will be marked from the ground with balloons. Also, there either will be a chase plane form which to monitor applications or MDA Gypsy Moth Control personnel will be a crew member in the spray aircraft.

There will be radio communications between the MDA site-marking crews, the loading crews, the chase plane and the spray plane to allow unexpected problems to be resolved quickly. Ability to communicate quickly is important. Authority to discontinue/ or cancel a site will reside with the supervising MDA Entomologist in charge of the contract or his designee in the chase plane, except when the chase plane is not airborne or is out of communication. Then cancellation authorization resides with the MDA ground coordinator, or otherwise with the one who discovers the problem.

Environmental Constraints- Buffer zones at least 100 feet wide around no-spray areas will be used to ensure that these areas will not be sprayed. B.t. will be applied near sensitive areas such as lakes, river, ponds, etc., or at least a 100 ft. buffer zone will be maintained when chemical insecticides are utilized. The precautionary measures and constraints that will be taken to minimize impact of this project on the environment, including non-target organisms, have been discussed in the "Application Constraints

Section".

Human Health- Insecticides used according to label directions will have virtually no human health risk associated with their use. However, the following additional precautionary measures will be utilized to minimize exposure of people working on the program and people in the treatment areas. The MDA will give to all residents within each spray block letters notifying them of the planned insecticide application. A similar notification will be sent to residents on properties immediately adjacent to the spray blocks. The notification letter will advise these citizens to remain inside during application. Those wishing to leave the area during the application phase can learn of areas not being sprayed from the local Cooperation Extension Service Office and then conveniently time this departure by calling the toll free number at MDA to find when their block will be done.

Residential areas will be sprayed during times when school children are not present where possible and application will be made in a manner that will minimize human exposure. Poison Control Centers will be informed of the insecticides applied in the local areas and if necessary, will be provided clinical or toxicological information regarding the insecticides in case of an accident or inadvertent human exposure during the application.

As mentioned previously, the property of those wishing not to be sprayed will be removed from the program and a 100 foot buffer zone instituted. All such residents will be written by MDA to confirm this. However, adjacent property owners may undertake by their own means legal application of pesticides to their own property in accordance with Federal and Maryland Pesticide Application Laws.

Standard pesticide mixing and loading precautions and label directions will be followed to minimize exposure at aircraft loading sites. All valves, hoses, barrels, etc. will be inspected and maintained to minimize spillage and human exposure. The proper safety clothing and equipment will be available at each loading site. The MDA staff will be present at each site to ensure that the materials are being properly mixed at the correct concentration for application.

It is expected that the vast majority of spray block residents will be asleep or otherwise indoors during the application (approximately one-half of all application occurs before 9 AM) or absent from the spray area. Thus, the major mode of exposure for the majority of people will be indirect dermal and inhalation exposure and exposure from eating fruits, vegetables, animals or water exposed to the application of these insecticides (see the Gypsy Moth Suppression and Eradication Projects FEIS ca suppl. 19815 pp. F 37-45 for discussion of exposure scenarios via these sources). The vast majority of total human population exposed to this program reside in congested residential areas where all these food items come from external sources. The telephone information number would allow the planned coverage, removal or delay in harvest of any fruit, vegetable and other food items that are located in treatment areas (e.g. milk cows in rural areas, home garden plots in suburban areas). Due to the treatment site selection criteria, all areas are predominated by tree foliage canopy and thus (a) insecticide deposition to underlying areas is drastically reduced, (b) gardens and other grazing areas are infrequently included in such heavily shaded areas, (c) direct appli-

cation to agricultural areas is avoided. This further reduces the probability of these food items being exposed to insecticide residues by this project.

The continuous observation of application is designed to virtually eliminate accidental spraying of unscheduled areas or using an unscheduled insecticide and this has been highly successful (see Gypsy Moth FEIS-85 p. F-48). Contract specifications call for clearance from the air and/or ground observer before the applicator proceeds to spray a new area. At the airport, spray block assignments re previously scheduled and aircraft loads are tailored for carrying only that amount of insecticide needed for the treatment block(s) scheduled for that load. Thus, improper application rate is immediately noticed when insecticide is left in tank or the insecticide runs out before block is observed to be finished and an investigation of the reason(s) for the overage/underage can begin immediately with inspection of the aircraft spray system, etc.

Operational exposure to insecticides is by far the highest degree of human exposure during this Project. Ground observers are instructed in manuals they are issued, to position marking balloons and then leave the treatment block to a strategic vantage point and/or remain in their vehicles (many vehicles have the communication equipment mounted in them anyway). Observers are fully clothed and advised to wash clothes daily.

Reconnaissance of spray areas with application pilots before spray operations are conducted to (a) familiarize them with proposed treatment areas and; (b) to discover any potential aerial hazards or application difficulties (swath judgement, etc.). This not only further reduces the probability of misapplication, it offers the opportunity to anticipate problems or hazards that may contribute to an accident, emergency dump or pesticide spill event.

Performance Monitoring

Monitoring of target pest development, application of insecticides, effectiveness of the insecticide, and environmental effects will be conducted during the suppression program. It is essential that adequate monitoring be conducted to assure proper evaluation of the program.

Application Monitoring - State personnel (MDA) at each site will supervise the on-ground operations and will make the decision to treat or to suspend treatments. Weather conditions will be obtained from local weather forecasts and local flight services. The decision regarding weather conditions being acceptable for application will be made by the MDA Supervising Regional Entomologist. The contractor can decline to fly if the equipment is not operating properly, if visibility or other factors are not satisfactory for flying, etc. Mixing and loading of the aircraft will be monitored by the MDA staff, who will also monitor the contractor for compliance with the contract or other constraints. The pilot is responsible for the concentration and quantity of insecticide mixture in each load. He is also responsible for proper maintenance of the aircraft and application equipment and for proper application of the insecticides.

Monitoring of application will be done mainly with the use of insecticide deposit cards. These cards will be placed in treatment areas, in buffer zones, and in non-treatment areas to monitor droplet distribution, drift, and application to non-target areas. An MDA-supervised ground crew will be present in each treatment site to indicate area to be sprayed and to observe the application. During application of insecticides, an MDA employee will accompany the application aircraft as a navigator. As an alternative, a chase plane from which an MDA employee can observe applications, and communicate with the application plane and the ground observers will be utilized.

Environmental Monitoring - Personnel at spray sites and at loading and mixing sites will be observant to determine any adverse environmental effects. Insecticides used according to label directions in this program should cause no adverse effect to the environment.

Beginning in early April, and continuing through May, field observations will be made for egg hatch, for larval development, and for leaf development of important host tree species. Application of the insecticides will be made at the proper time to be most effective and post-treatment larval population monitoring will be performed in sample treatment sites to determine if the insecticide was effective or if a second application of the insecticide needs to be made. All treatment sites will be evaluated to determine possible defoliation and its cause. Egg mass survey will be conducted in all treatment sites to determine effectiveness of the treatment.

If deemed necessary, the MDA will collect and analyze soil and water samples for presence of the insecticide applied. The environmental constraints discussed in the previous section will be monitored primarily by MDA staff by examining insecticide deposit cards. State and/or county officials will make an inspection of a treatment site when a complaint is received. Every effort will be made to satisfactorily resolve complaints.

STATE OF NEW JERSEY DEPARTMENT OF AGRICULTURE
COOPERATIVE GYPSY MOTH SUPPRESSION PROJECT-- 1985

INTRODUCTION

Gypsy Moth Status

Gypsy moth defoliation occurred on 165,100 acres in 1984. Defoliation declined substantially in the northern half of the State but is still causing considerable damage in the southern portions (see map). This is where most of the spray will be concentrated in 1985.

The Department's objective of protecting the most valuable woodlands (residential and recreational) by aerial spraying while the adjacent untreated areas collapse due to starvation, disease, and parasitoids is working as shown by the greatly decreased spray projects in New Jersey. Because of the limited financial and labor resources available to us the policy of selectively treating high value woodlands versus the uninhabited areas is the only feasible policy we can employ at this time.

The Cooperative Gypsy Moth Suppression Program last season began on May 16, 1984, and ended on June 4, 1984. A total of 36,688 acres in 50 municipalities was aerially treated. In addition, three county recreational and watershed areas, involving 1,358 acres, were treated under Department supervision.

By preventing defoliation in treated areas many trees were saved. During the conduct of the ground surveys special attention was given to evaluating the biological activity of natural controls within the residential areas. Where parasites and predators were in sufficient numbers to reduce egg laying, and consequently reduce defoliation, such areas were deleted from spray recommendations. However, if it was obvious that the egg count was sufficiently high and the natural enemies could not cope with these extreme conditions, spraying was recommended.

Aerial spraying was conducted with the insecticide carbaryl (Sevin 4-Oil), trichlorfon (Dylox), and the biological agent Bacillus thuringiensis (B.t.). Participation in this program was completely voluntary as well as the selection of material to be used. In 1984, 18,606 acres were treated with carbaryl, 15,368 acres were aerially treated with B.t., and 4,072 acres were treated with trichlorfon. The amount of carbaryl used was 24 ounces of active ingredient in 8 ounces of kerosene per acre. Bacillus thuringiensis was used at the rate of 12 B.I.U.'s per acre in 96 ounces of water. Trichlorfon was used at the rate of 1 pound A.I. per acre in 2/3 gallon oil.

Defoliation estimates from ground observations and infrared photography showed less than 5% defoliation occurring in the carbaryl treated blocks, less than 15% defoliation in the Dylox treated blocks, and averaging about 15% in the B.t. treated blocks.

In 1985, the Department is expecting some increases in population levels in northern New Jersey, and continued infestation levels at same high levels in southern New Jersey. In central New Jersey population levels are expected to remain about the same.

Purpose and Need for Action

Although the gypsy moth population declined in 1984 the pest continued to heavily defoliate nearly 165,100 acres of primarily oak forests.

The gypsy moth shows signs of increasing in northern New Jersey and is expected to persist especially in the southern half of New Jersey, at very high levels. Defoliation levels are expected to occur on nearly 200,000 acres and the proposed control measures are needed to protect and preserve valuable forest resources in residential and recreational areas.

The Cooperative Gypsy Moth Suppression Program provides an important service to the public that not only yields high benefits in relation to the cost but is also more environmentally acceptable than large scale spraying over uninhabited areas. In addition, sprays are only applied when necessary, during proper weather conditions and only at the E.P.A. labeled rate. This is generally not the case when each homeowner acts independently to control the pest.

PROPOSED PROJECT

Project Statement

The State of New Jersey, in accordance with the U.S.D.A. Final Environmental Impact Statement as supplemented--1985 for gypsy suppression and eradication projects proposes to use only the biological insecticide B.t. augmented by natural control agents, in an integrated pest management approach to suppress the gypsy moth populations in residential and recreational forests. The project will involve direct suppression on approximately 46,000 acres of private residential and public recreational areas distributed in 14 counties, involving about 250 spray blocks.

Organization

The State of New Jersey Department of Agriculture was given the legal authority and responsibility for suppression of gypsy moth populations by the State Legislature in 1921. At that time the legislature decided that the gypsy moth was to be "declared to be a public nuisance and the protection of vegetation or plant life therefrom is deemed to be a subject matter of public welfare" (Chapter 7 Title 4, Section 36 NJSA). Furthermore, "whenever, as a result of inspection as provided in Section 4:7-37 of this title, the Department shall find evidence of gypsy moth of its preliminary states, it shall have recourse to such recognized measures as it may deem advisable to abate and suppress the gypsy moth and its preliminary states and to protect therefrom surrounding vegetation or plant life."

The Department of Agriculture during the past 63 years has revised its objectives from a policy of total eradication of the gypsy moth to the present policy of conducting voluntary suppression programs aimed at protecting trees in residential and recreational areas. The Department regards the loss of valuable forest resources in these areas as an important matter of "public welfare." There is no doubt that the loss of trees around the home not only represents a substantial hazard to people and property but also represent a substantial financial burden for their removal. The gypsy moth management policy is to keep these losses at a low, more tolerable level. The agency official who is responsible for the proposed project is John D. Kegg, Chief, Bureau of Plant Pest and Disease Control, Division of Plant Industry in the New Jersey Department of Agriculture.

Objectives

The primary objective of the program is to prevent host tree loss in residential and recreational forested areas. This will be accomplished by aerial spraying to prevent defoliation from exceeding the 40 percent level. Population reduction is also desired such that treatment is not needed the following year.

Many of the areas recommended for treatment in 1985 were defoliated in 1984, and are expected to be defoliated again this spring. The criteria used to determine whether or not objectives were met will include a comparison of ground defoliation levels and percent larval reductions in both treated and non-treated areas. Aerial sketch mapping will also be used to evaluate the degree of foliage protection.

Biological Monitoring

Monitoring the gypsy moth is a continual process. Egg mass surveys are conducted from August through February. This year 125 of the State's 567 municipalities have requested gypsy

oth egg mass surveys.

In order to evaluate the success of the aerial spray operation, tar paper bark flaps are placed in both treated and untreated blocks for comparative purposes. These flaps are used to determine the number of caterpillars in the treated versus the untreated areas. By using paired sampling procedures, an overall average of the reduction of caterpillars can be measured. At the same time, Plant Industry inspectors estimate the percent defoliation of host trees in treated and untreated forests, again, for comparative purposes. The bark flap surveys are conducted from June through August. Although the emphasis is on larvae counts, the pupal and egg mass numbers appearing under the bark flaps are also noted.

Aerial surveys are conducted over treated and untreated areas to determine the level of gypsy moth caused tree defoliation. These areas are sketched on maps and the flights are conducted during June and July. The information from the aerial flights are used to evaluate the degree of foliage protection in treated areas.

Nearly all treatment areas are observed during the aerial sketch mapping survey and approximately half of the treated areas are checked from the ground to determine the degree of foliage protection and larvae reduction.

Treatment Area

Location (s).--The proposed project will take place on approximately 46,000 acres in residential and recreational areas involving approximately 50 municipalities located mostly in the southern half of the State (See Figure 1 and Table 1.)

The treatment areas will be marked with helium filled balloons and kytoons and a chase plane will be used to check spray pilot over treatment sites.

Selection Criteria.-- The selection criteria used to determine areas that qualify for gypsy moth aerial spraying is accomplished using both ground and aerial survey techniques. Beginning in August, Plant Industry inspectors conduct ground egg mass surveys in towns where specific written requests have been received. The inspection crew sketches all defoliated areas on a topographic map before visiting the town. Using the defoliation map, the inspectors concentrate in residential areas within the defoliated area and establish 1/40 fixed radius acre plots to determine the level of gypsy moth infestation. When a sample site exceeds 500 egg masses or more per acre, it is considered a positive site and circled in red on the topographic map. If the site is less than 500 masses per acre it is circled in blue. The number of survey sites used in a town depends on the severity of infestation. Normally, in severe

Figure I
PROPOSED GYPSY MOTH
TREATMENT AREAS
1985



Table 1.. Gypsy Moth Acres to be Treated with B.t., 1965

<u>County</u>	<u>Municipality or Agency</u>	<u>Acres to be Treated with B.t.</u>
<u>Atlantic</u>	Buena Vista Twp.	400
	Egg Harbor Twp.	1,800
	Galloway Twp.	510
	Town of Hammonton	1,230
	Mullica Twp.	3,245
	City of Port Republic	170
	Weymouth Twp.	780
		<u>8,395</u>
		Total Acres
<u>Bergen</u>	Mahway Twp.	250
		Total Acres
<u>Burlington</u>	Bass River	285
	Evesham Twp.	1,490
	Boro of Medford Lakes	650
	Medford Twp.	2,935
	Pemberton Twp.	880
	Southampton Twp.	515
		<u>6,755</u>
		Total Acres
<u>Camden</u>	Berlin Twp.	430
	Lindenwold Boro	60
	Boro of Stratford	120
	Voorhees Twp.	375
		<u>985</u>
		Total Acres
<u>Cape May</u>	Lower Twp.	175
		Total Acres
<u>Cumberland</u>	City of Bridgeton	215
	Fairfield Twp.	295
	Lawrence Twp.	555
	Maurice River Twp.	1,790
	City of Millville	3,105
	Vineland City	3,100
		<u>9,060</u>
		Total Acres
<u>Gloucester</u>	Elk Twp.	185
	Boro of Newfield	290
	Washington Twp.	1,235
		<u>1,710</u>
		Total Acres
<u>Mercer</u>	Hamilton Twp.	225
		Total Acres
<u>Middlesex</u>	Monroe Twp.	815
	South Brunswick Twp.	525
		<u>1,340</u>
		Total Acres

<u>County</u>	<u>Municipality or Agency</u>	<u>Acres to be Treated with B.t.</u>
<u>Monmouth</u>	Howell Twp. Millstone Twp. Tinton Falls Upper Freehold Twp.	1,695 200 110 <u>270</u> <u>2,275</u>
		Total Acres
<u>Morris</u>	Jefferson Twp. Kinnelon Twp. Rockaway Twp. Montville Twp.	85 625 845 <u>420</u> <u>1,975</u>
		Total Acres
<u>Ocean</u>	Barnegat Twp. Brick Twp. Dover Twp. Eagleswood Twp. Jackson Twp. Little Egg Harbor Twp. Plumsted Twp.	180 2,015 820 115 2,525 615 <u>680</u> <u>6,950</u>
		Total Acres
<u>Salem</u>	Lower Alloways Creek Pittsgrove Twp.	385 935 <u>1,320</u>
		Total Acres
<u>Cooperating Agencies</u>		<u>Acres</u>
Garden State Parkway Middlesex Co. Parks Stockton State College		1,660 80 <u>125</u> <u>1,865</u>
		Total Acres
Grand Total		44,775 Acres

outbreaks, survey points are established anywhere from a quarter to a half-mile apart. In marginal situations survey plots are normally spaced closer together and more plots are needed to determine whether or not the area qualifies for spraying. The inspectors are instructed to look for any signs of "biological pressures" which could result in a collapse of the gypsy moth population. By examining the pupal cases and studying the size of the egg masses, one can determine the activity of the biological agents. In areas where the biologicals are expected to keep defoliation levels below 50 percent, no spraying is recommended. Areas where defoliation is expected to exceed 50 percent of the host tree population, and have had a history of defoliation the previous year, receive the greatest priority for possible aerial treatment. However, the final decision to spray is made by the town.

The Selection Criteria used to determine that areas qualify is as follows:

1. Forested communities with at least ten (10) homes per 50 acres, defoliated once and expecting heavy defoliation next spring based on gypsy moth egg count.
2. Municipal and county recreational areas defoliated once and expecting heavy defoliation next spring.
3. Forested communities with five (5) homes per 50 acres defoliated once and expecting heavy defoliation next spring.
4. Forested communities with at least ten (10) homes per 50 acres, or recreational areas not defoliated yet but expecting heavy defoliation next spring.
5. Watershed areas defoliated once and expecting heavy defoliation next spring.
6. Uninhabited high value timber forests, defoliated once and expecting heavy defoliation next spring.

Treatment Selection

Treatment.-- The selected treatment to meet the short-term objectives of the projects includes only the use of the biological insecticide B.t., applied aerially.

Selection Criteria.-- The decision to use only B.t. this year was based on the fact that better, more effective formulations are now available and public acceptance of B.t. is greater.

Bacillus thuringiensis will be applied once on approximately 46,000 acres at a dosage rate of 16 B.I.U.'s per acre in 96 ounces of water (including 2 oz of sticker).

Method of Treatment

Insecticide applications will be done aerially using the following or similar-type helicopter or fixed-wing aircraft equipped with conventional spray systems using flat fan type nozzles: Grumman Ag-Cat and Sikorsky S-55, both of which have an approximate 200 gallon capacity; small Bell helicopter(s) with a 60-80 gallon capacity; and possibly some twin-engine aircraft such as a DC-3, Aztec or Twin Beech, for use on large, continuous spray blocks.

Calibration of the equipment will be done by the contractor initially and checked by the Department of Agriculture once spray operations begin. This will be checked from the air using stop watches and checking the "boom spray time" for a known volume of material carried by the airplane. Once the aircraft are initially calibrated, spot checks will be conducted during the operation to detect any changes. However, the aircraft will be generally loaded with the amount necessary to do the designated spray blocks and if there is any deviation in acres and gallons used, a re-check of the aircraft will be done.

The spray operation will be conducted by applicators certified by the New Jersey Department of Environmental Protection, and pilots will have to have a minimum 1,000 hours and more than 1,000 hours of aerial application experience, which at least 100 hours were devoted to forest treatment. During the spray operation, Department of Agriculture personnel will observe the spray aircraft in a chase plane. The purpose of the chase plane is to guide the pilot to designated spray areas, observe that the pilot does proper swathing, check for clogged nozzles and recommend that equipment be recalibrated if necessary.

Communications will be established between the chase plane and the spray plane as well as between the ground operation and the chase plane. For example, if winds increase to a point where spraying should be suspended, the chase plane will relay this message to the spray aircraft and suspend the operation.

This year, to achieve greater accuracy in the timing of B.t. sprays, the State will be divided into two spray zones. The contractor will work exclusively in his assigned zone until all treatments are completed. Spraying will begin on May 9th in the southern and central zone, and on May 15th in the northern zone.

Safety Considerations

A detailed work and safety plan will be developed similar to past gypsy moth suppression projects. Briefly, the following summarize the safety plan.

A careful surveillance is maintained of all spray aircraft through the use of observation aircraft and constant radio communication.

Reporting sheets are provided for ground personnel to collect all necessary information in case of accidental pesticide spills or an aircraft accident where insecticides are involved.

Mixing tanks, hoses, pumps, and spray systems are inspected before and during the spray operation.

First aid kits and fire extinguishers are provided by the Department of Agriculture and the contractor at the work site.

Residents in all treatment areas are notified by letter at least 10 days before spraying begins so they can take whatever measures deemed necessary to avoid contact with the pesticide if they so desire.

Bacillus thuringiensis has been used by the Department for gypsy control for the past three years in New Jersey. Two formulations, Dipel and Thuricide, are registered by the Federal EPA for use in forested residential areas and are exempt from the requirement of a tolerance level for residues on food crops.

Bacillus thuringiensis are mainly transported in 50 gallon drums and it is the responsibility of the spray vendor to properly dispose the containers.

Benefit/Cost Analysis

In 1984, a total of 38,046 acres in 50 municipalities and three recreational areas was treated. The 1984 cost of aerially spraying varied between 5.85 - 10.85/acre depending on spray unit and insecticide used. The total project cost, including pre and post-survey evaluation work, supplies, and supervision of the spray project was 655,917 of which 327,958 was provided by State and local governments. The areas treated were generally small residential lots, along with some larger county park and recreational areas.

Cost for homeowners to hire ground equipment to treat an average woodlot (one quarter acre) ranged between \$20 to \$80 per lot or \$80 to \$360 per acre. In cases where private landowners hired aerial applicators to treat residential areas, the cost ranged between \$15 to \$120 per acre, using the material carbaryl, trichlorfon, or B.t.

In 1985, the Department is proposing treatment of approximately 46,000 acres at an estimated cost of \$1.2 million. All areas will be treated with B.t. at a cost of aerial spraying for private contracting was \$50 per acre in residential areas, the anticipated cost benefit/ratio is 2:1 when all program costs are considered. This ratio will most likely increase to 3:1 if vendor bids are lower. When the cost of aerial spraying is compared to ground equipment taking an average of \$100 per acre, the effective benefit-cost ratio averages 4:1.

Other values lost due to unchecked gypsy moth damage, but not readily put into an economic equation, include the following: repainting of homes stained with dead and dying caterpillars, (average cost \$1,200) removal of hazardous trees killed by repeated gypsy moth defolations (average cost \$300/tree), replacement of trees killed by gypsy moth defoliation (average cost \$250 to replace a 8" d.b.h. tree), and the costs of attempting to control the insect using a variety of mechanical techniques which include trapping, egg scraping, spraying and other means of control which offer very little protection during outbreak conditions. This control can go as high as \$40/acre (not including labor).

It is anticipated that approximately 50 percent of the 1.2 million dollar cost will be returned to the State and local governments in the form of federal cost-sharing. Such cost-sharing would not be available to individuals undertaking aerial controls outside of the Department's supervised program.

Scoping Activities

The New Jersey Department of Agriculture, in cooperation within the New Jersey Department of Environmental Protection, conducted a Scoping Session in Trenton on December 17, 1984. A total of 34 organizations were contacted and 21 persons attended the session. There were 5 oral presentations presented by the public, and 3 written were received. A list of organizations contacted are shown below:

1. Highlands Watershed Assoc.
2. Upper Raritan Watershed Assoc (3)
3. Assoc. of N.J. Env. Commission
4. N.J. Coalition for Alternatives to Pesticides
5. N.J. Conservation Foundation
6. N.J. Beekeepers Assoc (2)
7. N.J. Department of Health (2)
8. Sierra Club (2)
9. American Littoral Society
10. South Branch Watershed Assoc. (2)
11. N.J. Audubon Society
12. League of Women Voters
13. Downstown Aero Crop Service Inc.

14. Monmouth County Shade Tree Commission
15. N.J. Department of Environmental Protection (3)
16. Mountain Lakes Shade Tree Commission
17. Bergen County Park Commission
18. N.J. State Mosquito Commission
19. USDA - APHIS (3)
20. U.S. Fish and Wildlife Service
21. NY-NJ Trail Conference Inc.
22. N.J. Division of Fish, Game, and Shellfisheries
23. Arborists Assoc. of N.J.
24. Delaware River Basin Commission
25. Stony Brook-Millstone Watershed
26. N.J. Christmas Tree Growers
27. Society of American Foresters
28. N.J. Forestry Association
29. N.J. Federation of Shade Tree Commission
30. Environmental Action Coalition
31. Appalachian Mountain Club
32. Trout Unlimited
33. Newark Star Ledger (3)
34. Pinelands Commission

The issues and concerns raised at this scoping session were generally the same as last year and related to the area of human health, individual rights and spraying when school children were walking to school. All these areas were addressed in the 1984 site specific environmental assessment (p. A62-A64). Most of these issues and concerns have been addressed by the Department's January 8, 1985 decision to use only the non-chemical insecticide B.t. in 1985.

AFFECTED ENVIRONMENT

Host Vegetation

New Jersey has approximately 1.2 million acres of hardwood forest, 80% of which is comprised of oak species, which are highly preferred by the gypsy moth larvae. During the spring and summer of 1984 approximately 165,100 acres of these preferred oak types were defoliated by the gypsy moth. Nearly all of the spray project area consists of residential homes built in these native oak forests. The oaks growing around these homes are normally 10-20" d.b.h. and are species of the red oak and white oak groups. Recreational areas recommended for treatment are also primarily comprised of oak. The host vegetation is similar on all sites proposed for treatment.

Potential Treatment Sites

Approximately 90% of the spray project will be conducted in residential forested areas with a minimum of 5 homes per 50

acres and in some cases as many as 200 homes per 50 acres. It is estimated that there will be about 10 people/acre in areas treated. An estimated 5% of the project will be conducted in recreational forested areas which have few, if any, permanent residences on site.

Non-Target Organisms

Non-target mammals found in these areas include household pets (dogs and cats) as well as mice, squirrels and moles. Many species of birds may also be found.

Since these areas do not contain habitat suitable for endangered animal species, and none are known to exist.

Pollinating insects including the honeybee, and several species of gypsy moth parasites can be found in or near the proposed treatment areas. These would not be adversely affected by B.t. sprays.

Geography

The physical setting of the project area in New Jersey is quite variable. The northern sections of the State are comprised of broad ridge tops with elevation to 1,800 feet. The area is generally rocky with numerous lakes. In the central part of the State, the area is relatively flat and some hilly sections and relatively few lakes are found. In northern and central New Jersey, the forest are mainly comprised of oak which is the most highly preferred host species of the gypsy moth caterpillars. In the southern sections of the State, oaks were found generally along the Delaware River down through Cape May County and along the eastern shore areas. Topography in southern New Jersey is generally very flat and the soils are sandy. Since the host type, mainly oak, does not grow well in the wetlands, very little of the spray project will be conducted there. The land use patterns in the affected geographic area are mainly residential areas established in native oak forests.

ENVIRONMENTAL CONSEQUENCES

Beneficial Effects

The environmental consequences, beneficial and adverse, of using B.t. are documented in the USDA Final EIS as supplemented--1985, for gypsy moth suppression and eradication projects. The available literature on B.t. evaluated in the USDA Final EIS does not identify any human health risks associated with its use in gypsy moth projects.

The 1985 Gypsy Moth Suppression Project will essentially have the following positive effects on the physical, biological and social aspects. The physical benefits are derived from the fact that the host trees will most likely not receive more than 40 percent defoliation, and therefore, tree losses will be greatly reduced. Another physical benefit of maintaining full foliage is the fact that its cooling effects benefit birds, mammals, and insects visiting the areas. Severely defoliated woodlands have an adverse biological impact by affecting nesting birds and heating up the litter layer, greatly increasing the fire danger, and affects soil organisms. Regarding the social aspects and the benefits derived from aerial spraying, the maintaining of trees in full foliage can have a benefit of the cooling effect making the outdoors more enjoyable and at the same time reduce noise pollution. Another positive social effect is reducing the number of larvae which can cause human skin irritations as well as staining of homes and sidewalks from frass and decomposing larvae. Also, reducing the hazard of dead and dying trees around the home has many distinct benefits.

Adverse Effects

The possible adverse effects of the proposed spray project include a temporary reduction non-target lepidopterous insects within the spray block.

Irreversible or Irretrievable Commitment of Resources

Certain manpower and monetary resources committed by the Department are irretrievable. However, the dollars spent on resources such as fuel, salaries, and various supplies will yield to positive effect in terms of protecting the forest resources from unacceptable economic and aesthetic losses. Without State assistance, many homeowners would resort to uncoordinated spraying at substantially highest costs and using greater amounts of insecticides per unit area. The Local governing body, by their request to participate in the voluntary aerial spray program, consider this project to be worth the financial commitment.

Human Health

The human health effects of B.t. are discussed in detail in the draft supplement Final EIS as supplemented--1985.

In reviewing the literature, the USDA FEIS as Supplemented-1985 reports 2 studies documenting possible adverse human health effects related to B.t. These studies discuss the isolation of vegetative cells and spores of B.t. from a severe skin infection and an eye ulcer. These infections represent the first reported occurrence of an infection in humans caused by B.t. Neither incident resulted during the aerial application of B.t.

The potential for general public exposure to B.t. is limited due to the early morning nature of the spraying when most people are indoors.

Though B.t. is registered for use on a wide variety of vegetable crops, people with backyard gardens in the spray area are advised to rinse leafy greens that are harvested after spraying.

In the USDA FEIS as Supplemented-1985, no human health uncertainties were identified in any review comments. No uncertainties as to the human health effects related to the use of B.t. were identified during the NJ Department of Agriculture public scoping sessions.

ADMINISTRATION REQUIREMENT AND CONSTRAINTS

Guidelines for Local Government Participation

Spraying will not only be done on a voluntary basis with local governments that agree are willing to fully accept the following conditions for participation in the aerial spray program:

1. Request in writing an egg mass survey to determine the status of the gypsy moth infestations in residential and recreational forests.
2. Arrange for financing the total cost of any treatments recommended and make contractual agreement with the spray vendor, either provided by the State or obtained by local bidding.
3. Assist in the administration and coordination of the spray programs, providing a town coordinator and all necessary labor to make spray block boundaries.
4. Adopt a resolution declaring the gypsy moth a "Public Nuisance". The Public must be notified in advance, pursuant to the Open Public Meetings Act for Proposed Municipal Action (N.J.S.A. 10:4-9), of the date, time and place that the gypsy moth resolution will be discussed. A copy of this notice must be sent to the Department of Agriculture.
5. Notify the occupants by a properly served notification of the intent of the spray program. Spraying will only be done between the hours of 5:30 A.M. to 12:00 noon, and 5:00 P.M. to 8:00 P.M. No community or area-wide pesticide application for gypsy moth control may take place between 7:30 A.M. and 8:30 A.M. within two miles of a school housing grades kindergarten through eighth grades or within 2½ miles of schools housing grades nine through twelve.
6. A "contact" person(s) shall be selected by the municipality so that residents may call to obtain the latest information on the aerial spray application, especially if spraying is postponed. The telephone number of the "contact" person shall be made known to the town residents.
7. In addition to the resolution, a responsible municipal official shall certify to the Department of Agriculture that these notices have been served as outlined in the guidelines. No work will begin until this certification is filed with the Department of Agriculture.

8. To give, on behalf of the Department of Agriculture, the notices required by N.J.S.A. 4:7-39.

Public Involvement

Since the participation in the Gypsy Moth Suppression Project is completely voluntary, the public is very deeply involved in the decision making process. All decisions regarding participation in the gypsy moth survey program and control measures are made at the local government level.

State Responsibilities.-- Areas are selected that fit Department criteria; however, local governing bodies can delete any portion of the spray block they wish.

However, if blocks are added which do not fit Department criteria, then the local community is obligated to finance and conduct such operations separately. The Department regards the gypsy moth spray effort as an important service to the local communities since it is conducted under close supervision, using minimal amounts of insecticides, and only done during proper weather and entomological conditions. The cost is also much more reasonable, especially when Federal cost-sharing funds are available.

The Department is also responsible for informing the Office of Pesticide Control, Division of Aeronautics and the Division of Fish and Game of the Proposed Gypsy Moth Suppression Project.

Local Responsibilities.-- Requests for the egg mass survey as well as requests for participation in the aerial spray project must be in writing for a town to enter the Department's program. The towns must also allot the necessary funding and assign personnel to work with the Department inspectors. Also, they must fulfill all legal requirements as written in Statutes. The Local government also decides which spray material to use. Probably the most important facet of public involvement is declaring the gypsy moth a "Public Nuisance" at a public town meeting. This gives the residents an opportunity to discuss the gypsy moth problem at a township meeting. Normally, if there is great opposition to the program by local residents, the town will not adopt the resolution.

Public Notification

State Responsibilities.-- The Department is responsible for preparing drafts of the local "Public Nuisance" resolution to be adopted by the municipality as well as drafting the spray notification letters to be mailed to local residents.

The Department also issues a news release several weeks before the program begins to inform the public of all towns planning to participate in the Cooperative Gypsy Moth Spray Program.

The Department is responsible for organizing regional meetings to inform local officials of the labor needs, legal requirements and financing of the aerial treatment programs.

Local Responsibilities.-- In order to meet the State Statutes, several requirements have been established with regard to proper notification of all occupants who reside on the lands selected for treatment. ^{1/} These guidelines have been reviewed by our Department's Deputy Attorney General. They are as follows:

- a. By two separate insertions in a newspaper qualified to accept legal notices published in the county of the proposed treatment or other action and circulating in the affected areas. The two insertions shall appear at least seven (7) days apart, the first of which shall be not earlier than 21 days prior to the proposed date of treatment or other action and the second of which shall be not later than (7) days prior to the proposed date thereof; and
- b. By mailing a notice by regular first class mail to the occupant of each affected parcel of property no later than ten (10) days prior to the proposed date of treatment, or other action.

The local governing body must pass a resolution declaring the gypsy moth a "Public Nuisance" at a regular scheduled town meeting. Also the subject of declaring the gypsy moth a "Public Nuisance" must be advertised in the local newspaper prior to the meeting.

Local officials must also attend one of the State regional gypsy moth meetings or they will be deleted from the program.

Precautionary Measures and Constraints

The Department's function in the aerial spray operation is to ensure that only designated areas are sprayed where the public has been properly notified. Also, the Department must be assured that the proper dosage of the spray materials are applied in accordance with label directions.

^{1/} L. 1921, c8, S.4, p. 28, 1924 Suppl. S4-1151, as revised in Assembly Bill No. 1380.

Application Constraints.-- To ensure that only specified target areas are sprayed, certain application constraints are placed on the program. The winds shall not exceed 10 miles per hour. The air temperature is less than 80% fahrenheit, the foliage is dry, and inversion conditions are not present. Areas will be treated using helicopter or fixed wing aircraft which fly approximately 50 feet above tree tops with a swath width varying between 100-175 feet. The treatment areas will be marked using kytoons or red marking balloons so that the pilot can accurately define spray block with the pilot and in many cases a pre-treatment flight over the proposed treatment area will be undertaken. The maps used are USGS topographic maps scale at 1 to 24,000. These maps show lakes, forests, and land features which are important guides to the pilot. Spraying will be conducted in the morning between the hours of 5:30 A.M. and 12:00 noon, and 5:00 P.M. to 8:00 P.M. in the evening.

Environmental Constraints.-- Environmental constraints are not known for B.t.

Human Health.-- Although no human health problem has ever developed during the past 20 years of gypsy moth aerial spraying, there is no doubt that this area has been receiving greater attention in recent years. The process of notifying the public has been discussed in earlier sections of this document. In addition to statutory mandated procedures, a "contact" person(s) will be established in the municipality to be sprayed so that residents or persons with sensitivity to insecticide can call to obtain the latest information concerning the status of insecticide application.

Occasionally, scheduled spray applications may be postponed due to inclement weather and thus resident will have an opportunity to obtain updated information and adjust their plans accordingly.

The phone number of the contact person will be made known to the residents of the municipality by the governing body.

Pesticide spraying will only be done between the hours of 5:30 A.M. and 12:00 noon and from 5:00 P.M. to 8:00 P.M. This would establish a definite time period in which residents may make plans, if they desire, to remain indoors or leave the area for that time period. No community or area-wide pesticide application for gypsy moth control may take place between 7:30 A.M. and 8:30 A.M. within two miles of a school housing grades kindergarten through eighth grades or within 2½ miles of schools housing grades nine through twelve. This procedures will minimize exposure to children who walk to school.

Since the B.t. is a liquid formulation, inhalation of material is not significant. Long sleeved shirts, rubber boots, and gloves will be recommended to contractor employees to minimize their exposure to the pesticide.

The entire Gypsy Moth Suppression Program is a cooperative effort depending on a definite partner type relationship between the State and local government.

Performance Monitoring

The Department of Agriculture has specific monitoring procedures which occur during the spray operation to ensure that the application is done in accordance with label directions and within statutory constraints.

Application Monitoring.-- Application monitoring is accomplished both from the ground and from the air. Chase planes are used to monitor the spray aircraft. Their function is to guide the designated treatment block, follow the spray plane to insure proper swathing and to communicate with the pilot should nozzles get clogged or weather conditions change resulting in the cancellation of the spray period. Also, the chase planes can be used to detect drift due to thermal inversions or excessive winds above tree top levels. By observing the spray as it leaves the airplane, drift can be monitored. If drift is moving into non-target areas, adjustments will be made to either suspend the operation or move the airplane back from the non-target areas. Occasionally insecticide deposit cards are used, but in the case of carbaryl they are not necessary. This is due to the fact that the material is easily spotted on foliage because it is white. Bacillus thuringiensis is more difficult to detect, but having vehicles parked under the spray plane in the designated treatment blocks can monitor droplets from the ground. Spray cards can also be used.

Monitoring of mixing and loading phases of the spray operation is conducted by Department personnel. They keep records of the amount of material loaded into the airplane, the time the plane leaves the airport and the time it returns.

Weather monitoring as discussed earlier is conducted from both the ground and the air. If ground crews report winds too high for effective application, the chase plane is radioed and in turn the spray plane is advised to suspend operations. The inspectors on the ground or the observer in the chase plane make the decision whether or not to continue treatment or suspend the spray operation.

Monitoring of buffer zones and no treatment areas is accomplished by using a chase plane to ensure that the spray material does not drift into non-target areas.

Environmental Monitoring.-- Environmental monitoring is accomplished in cooperation with the Department of Health. In past years, studies have been conducted by the Department of Health

to monitor the air and water as well as the amount of human exposure during actual spray operations. A copy of this report is available from the New Jersey Department of Health or Department of Agriculture. Basically, it is the conclusion of the Department of Health that the amount of human exposure is minimal and the amount of spray material present in the air and water is at a very minimal level and in some cases completely undetectable.

In order to ensure that the proper timing of application is accomplished, inspectors check spray blocks for foliage conditions, and size of gypsy moth larvae. When the white oak leaves are approximately 1/3 grown and red oak leaves approximately 1/2 grown, foliage conditions are proper for insecticide applications. Also, at approximately the same time, the gypsy larvae hatch is completed and the larvae are mostly in their second instar. Post-treatment monitoring of the gypsy moth population is done using a bark flap technique which has been described earlier in the report.

If reports are received from concerned individuals within the spray block that a skip has been made, an inspector is immediately assigned to check out the specific area. If he finds no spray deposits on leaves in conjunction with large numbers of active caterpillars, he will sketch in the skipped area and return the information to the airport for respraying. Also, if complaints are received that spray has drifted outside of the target zone, an inspector will be assigned to investigate the claim.

Defoliation monitoring is done by air and ground. During late June and July all sprayed areas are flown and checked for effectiveness of spray treatment. This is also supplemented by ground crews going through areas and checking for degree of foliage protection during post-spray evaluation checks.

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF FOREST MANAGEMENT
COOPERATIVE GYPSY MOTH SUPPRESSION PROJECT--1985

INTRODUCTION

Gypsy Moth Status

Gypsy moth populations throughout New Jersey have been declining since the peak year of 1981 when 798,790 acres were defoliated. During 1984 only 165,100 acres showed evidence of gypsy moth activity; the lowest level of defoliation since 1977 when 42,090 acres were affected.

This decreased level of activity was also reflected throughout the state forest/park system where oak was a prominent component of the forest species composition (116,259 acres). Only 4,775 acres within seven state forests and parks received heavy to severe defoliation.

Of the 1,478 acres treated in six state forests and parks during May 22-25, 1984, only two spray blocks will not require retreatment in 1985. The reason why defoliation occurred in most of the spray blocks can be attributed to several factors.

First is that most of the spray blocks were but small islands of attempted control in larger areas of infestation. It is possible that the pressure of the perimeter high populations resulted in an influx or migration of larvae into the sprayed areas.

A more important factor is that of the population level present in the spray blocks. Treatment utilized the biological insecticide Bacillus thuringiensis Dipel 6L at a rate of one quart mixed in two quarts of water. The available literature reveals that the use of Bt becomes less effective where egg mass counts are higher than 2,000 per acre. Most of the spray blocks harbored this high level of infestation. Probably if a higher dosage rate (16 BIU's)

rather than the 12 BIU's were used and/or two applications were made, control would have been high. With the exception of Ringwood State Park all the areas proposed for treatment were treated during 1984. The size of the spray blocks will be increased to insure the integrity of the areas where it is most important to achieve a high degree of control. Also, 16 BIU's will be the dosage rate. The following table (No.1) will outline the situation that occurred on state lands during 1984. Figure No. 1 shows the overall defoliation in New Jersey as occurred during 1984.

Table 1.--Gypsy Moth Defoliation Within New Jersey Forests and Parks, 1984

State Forest/Park	Acres Treated 1984	Acres Defoliated 1984	County
Allaire State Park	311	422	Monmouth
Bass River State Forest	-	129	Burlington/ Ocean
Belleplain State Forest	305	1,989	Cape May
Lebanon State Forest	301	616	Burlington
Parvin State Park	200	524	Salem
Rancocas State Park	117	-	Burlington
Ringwood State Park	-	635	Bergen/Passaic
Wharton State Forest	<u>244</u>	<u>460</u>	Burlington
' TOTAL	1,478	4,775	

In Bass River State Forest and Parvin State Park treatment will occur with combinations of DIPEL 8L at 64-96 oz. and NRD-12 and DIPEL 48 AF at 96 oz. as part of an evaluation to investigate alternative means of control.

Figure 1. - Gypsy Moth
New Jersey - 1984

Defoliation, State of



It is not anticipated that suppression programs will become necessary in northwestern New Jersey until the spring of 1986 at the earliest. Elsewhere, particularly in southern New Jersey, populations are expected to remain at low levels for the next several years.

Purpose and Need for Action

A suppression project is necessary in 1985 in order to prevent tree mortality, reduced tree vigor and growth increment, nuisance to campers, picnickers, and hikers that use the park/forest system and spread to surrounding protected susceptible forest lands. The species primarily protected are the red, white, black, and chestnut oak groups.

The gypsy moth contributes to either the direct death of oak trees or indirectly by weakening the trees so they become susceptible to invasion by boring insects or diseases. Forest resource plans completed in Stokes State Forest (Sussex County) and High Point State Park (Sussex County) show that approximately 30,786 cords and 5 million board feet were killed in Stokes during the years 1978 through 1981 and 2,544,136 board feet and 42,168 cords killed in High Point. The average age of the trees killed was 80 years old.

During the short period of time that the gypsy moth has been established in the southern counties of New Jersey substantial damage has resulted from several infestations in Belleplain State Forest.

Aerial and ground surveys in Belleplain (October-November 1983) have indicated that there are at least 6,606 cords of oak on 547 acres that can be salvaged for firewood over the next several years.

Without timely suppression measures, the forest resource within the state forests and parks will continue to deteriorate. Forest managers must deal with this problem with the effective means that are available. Forest management practices should be dictated by the implementation of resource plans rather than an insect pest which will disrupt the long and short range management goals.

PROPOSED PROJECT

Project Statement

The New Jersey Bureau of Forest Management proposes the use of Bacillus thuringiensis (Bt), augmented by natural controls, in an integrated pest management approach to suppress gypsy moth populations that have the potential to cause defoliation and subsequent tree loss. The project will involve the treatment of 6,000 acres within three state forests and three state parks.

Organization

The opinion of the people of New Jersey regarding the state's forest resource is revealed through their State Legislature. The Bureau of Forest Management exists within the Division of Parks and Forestry. As such, the State Legislature has deemed its duty to be under Article II C 13:1B-15.101 that of:

- a. Develop, improve, PROTECT, manage, and administer all state forest, state park, recreation areas, state historic sites, state natural areas, excepting those regulated by interstate compact.
- b. Protect ALL forests, ... from damage by fire, INSECTS, and disease, and promote the use of good forest management principles on all forest lands. In addition, New Jersey's legislators have yearly appropriated funds to be specifically used for control of gypsy moth outbreaks on state-owned lands. For example, the 1981 suppression project was funded at the state level following requests and recommendations made by nine Senators and 11 Assemblyman. That the people are anxious to pledge a substantial sum of money each year for this purpose exhibits their concern for the forest resource held in their trust for the future use of generations to come.

The person responsible for the proposed gypsy moth project is the Acting State Forester, Olin D. White, Jr. Project Leader is George Paul Koeck, Principal Forester in charge of insect and disease management on state-owned lands.

Objectives

The New Jersey Bureau of Forest Management maintains as its objectives the prevention of all moderate, heavy, and severe defoliation attributed to larvae of the gypsy moth (Lymantria dispar) on state-owned forests and parks. The ultimate goal is to reduce mortality among the oak species to no more than 4-5 percent above normal in both the forest proper and high use recreation areas. No more than 25 percent defoliation will be acceptable as measured by aerial and ground survey. A population reduction of 95 percent or more is preferred and will be determined by egg mass surveys undertaken the following fall and winter.

Biological Monitoring

Egg mass counts.--In order to determine the extent that suppression measures are necessary in each forest or park it is necessary to conduct egg mass surveys starting after egg laying and ending in late December. Forest Management personnel will utilize 1/40-acre plots in areas less than 500 acres and 1/10-acre plots and walk through methods within large acreages. Binoculars are used to better identify and count egg masses in the upper portions of the trees. At least 500 egg masses per acre are needed to consider treating a state forest or park.

During the presuppression monitoring, particular attention will be directed in recognizing larval hatch and any possible effects adverse weather conditions may have upon stressing a population.

Upon completion of the suppression measures in May-June, the egg mass survey undertaken the following fall-winter will serve as the primary indicator as to how effective the treatment the previous spring was. So in reality each egg mass survey amounts to both a post-supprssion survey of the previous year's spraying and an egg mass evaluation for any future treatment needs. All 116,000 acres of hardwood forest that exists within the state forests and parks are surveyed for new gypsy moth egg masses each year. This survey occurs regardless of a spray program.

Host tree foliage survey.--During the last week in June and the first weeks in July, an aerial defoliation survey is conducted to determine the extent and severity of foliage loss in the hardwood forest type (116,000 acres) of all state-owned forests and parks. A single engine Cessna aircraft is used during this survey in which a Bureau forester maps defoliation using the criteria of moderate (25-50 percent), heavy (51-80 percent), or severe (81-100 percent) foliage loss. This is a subjective estimate but years of experience in doing this result in an accurate estimation of the defoliation situation.

Particular attention is directed towards all those state lands in which suppression activities were conducted. The results of the treatment are mapped on USGS geological maps and colored photographs are taken to record treatment efficiency.

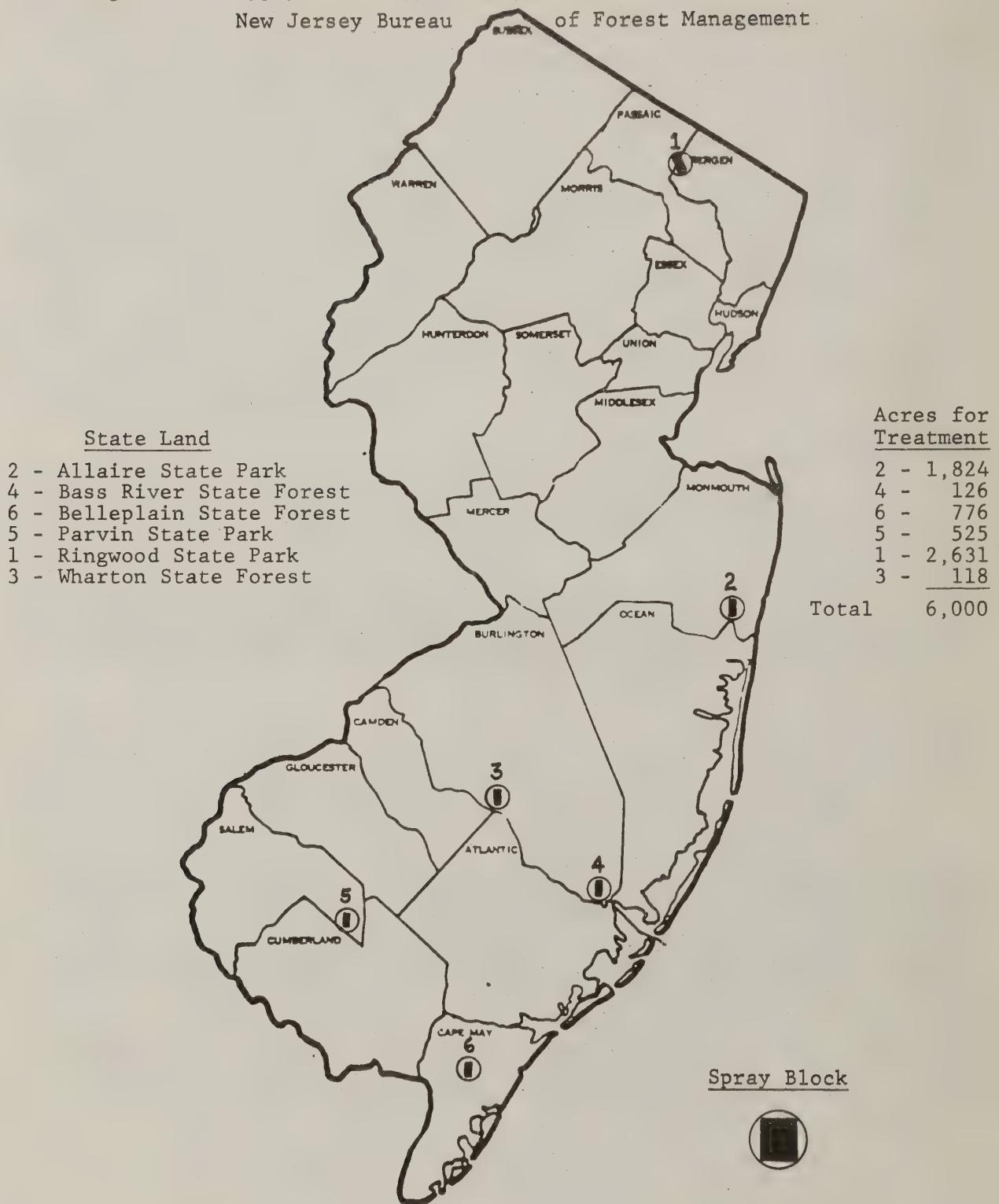
If the treatment areas show less than 25 percent foliage loss, than the Bureau of Forest Management considers the project successful at least in that respect. Any defoliation above 25 percent would be considered unacceptable and the reasons for this would be investigated so as to prevent future occurrences. A project would not be considered totally successful until after egg mass counts were made in each spray block.

Treatment Area

Locations.--The ground biological egg mass survey undertaken during the fall of 1984 has shown that gypsy moth populations are high enough to warrant treatment on 6,000 acres within the forest/park system. Emphasis of the survey was placed in those areas where the aerial reconnaissance discovered varying levels of defoliation. Figure No. 2 will show the approximate spray block locations. Detailed spray block maps can be obtained from state headquarters in Trenton, New Jersey.

Figure 2. - Gypsy Moth Suppression Project - 1985

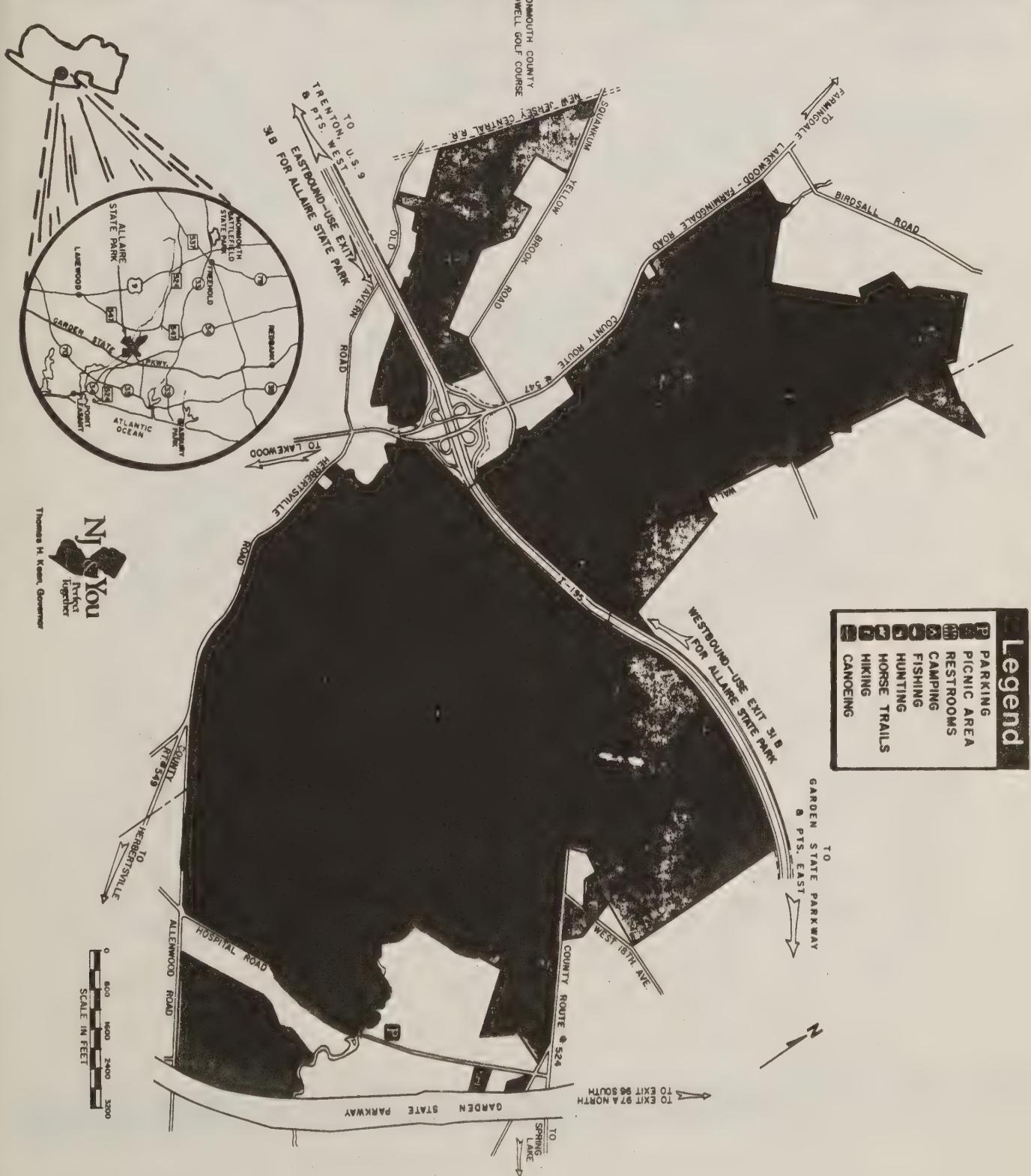
New Jersey Bureau of Forest Management





Allaire State Park

New Jersey



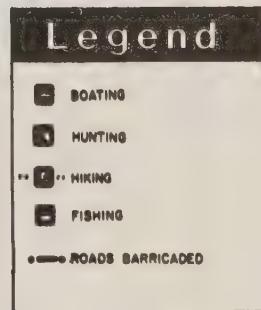
NJ
You
Protect
Together
Thomas H. Kean, Governor



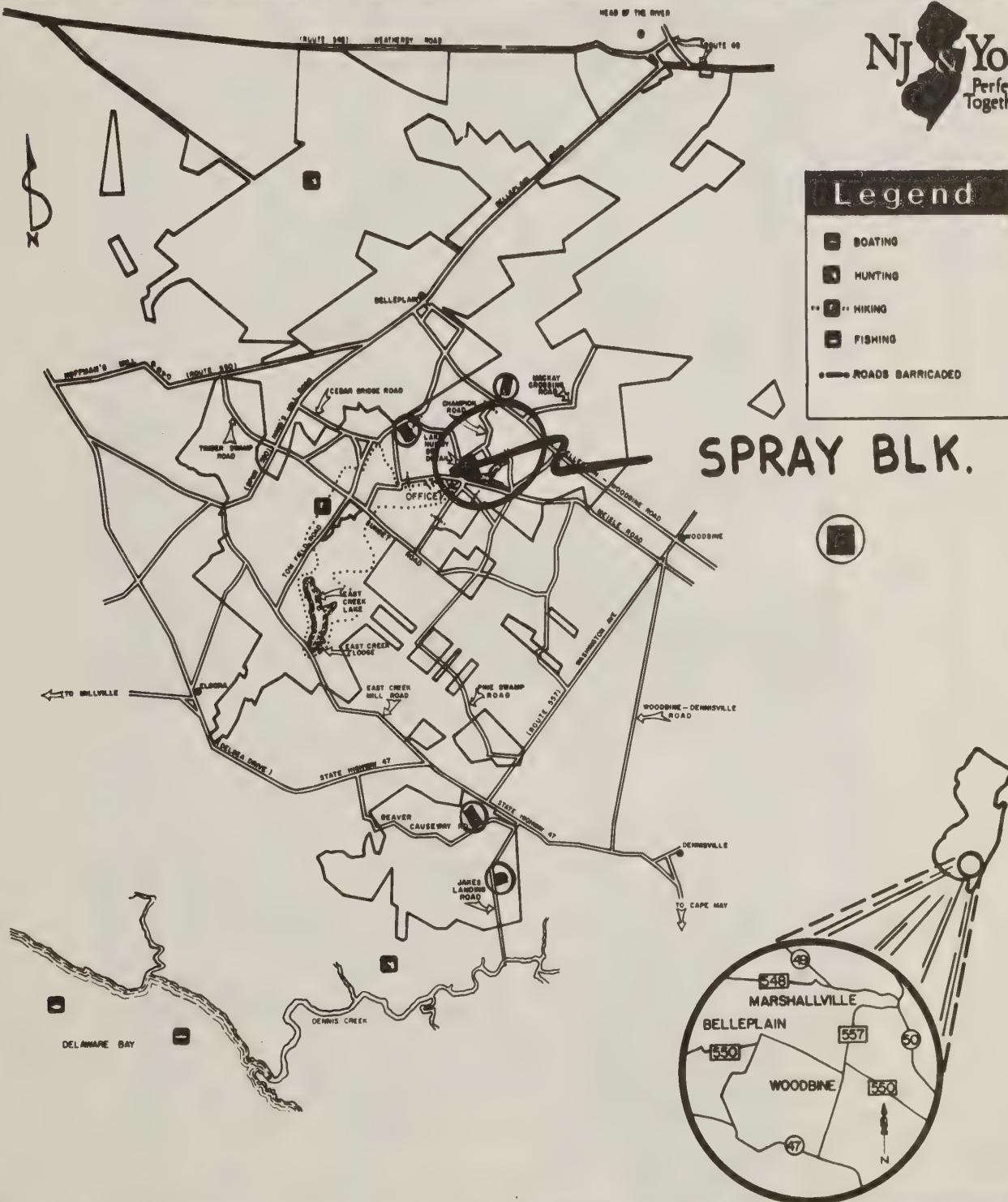


Belleplain

State Forecast

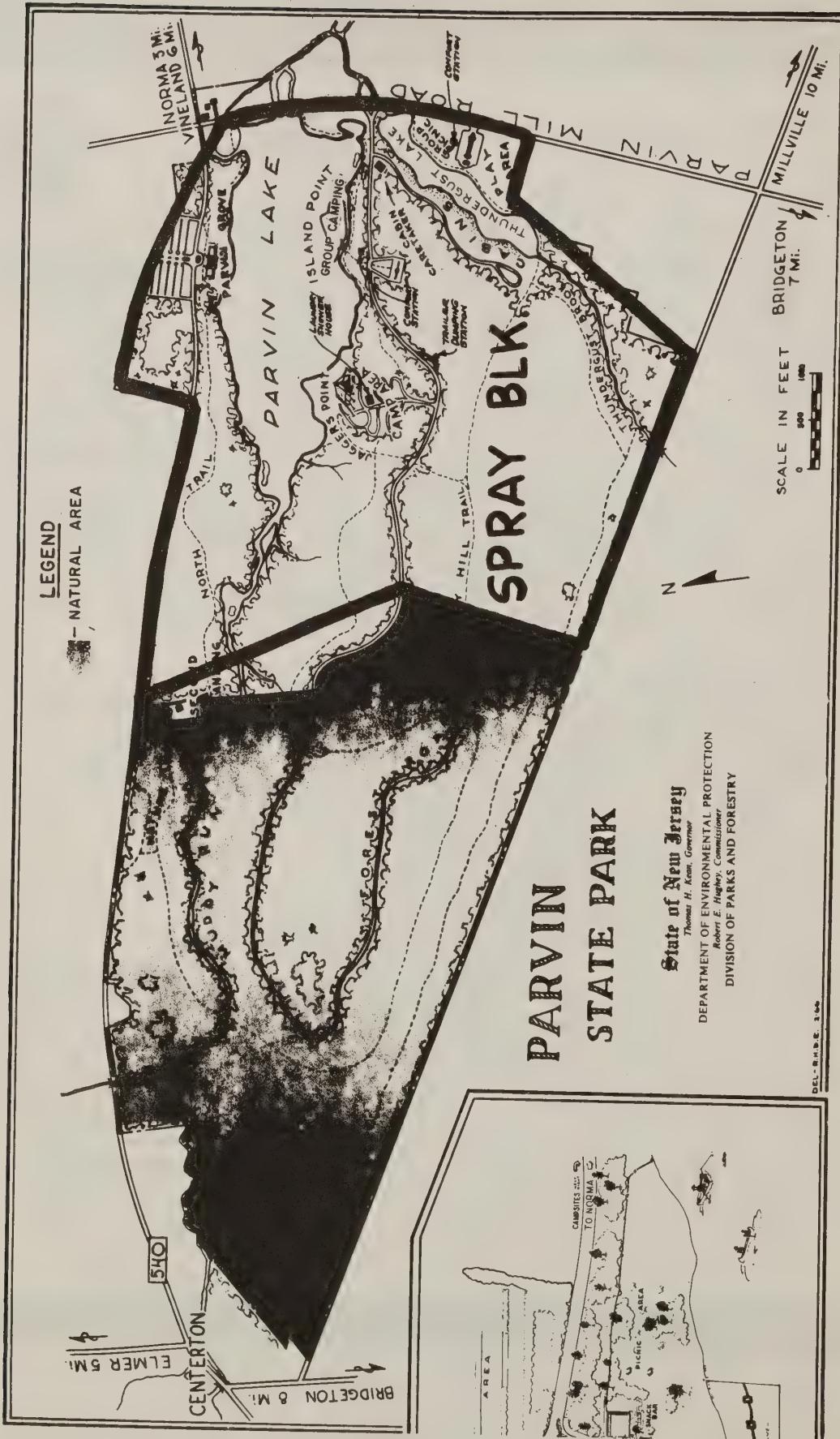


SPRAY BLK.

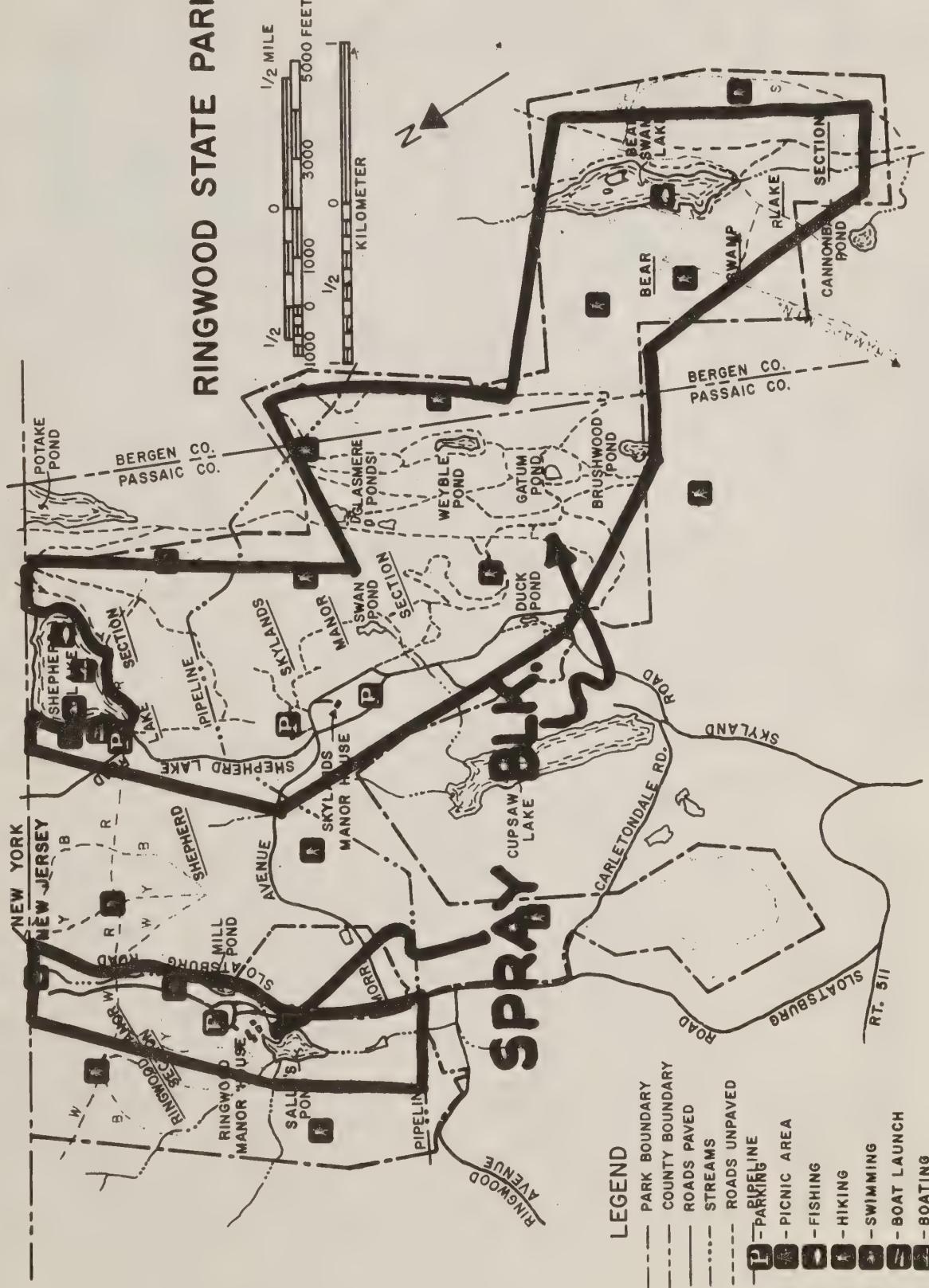


LEGEND

- NATURAL AREA



RINGWOOD STATE PARK



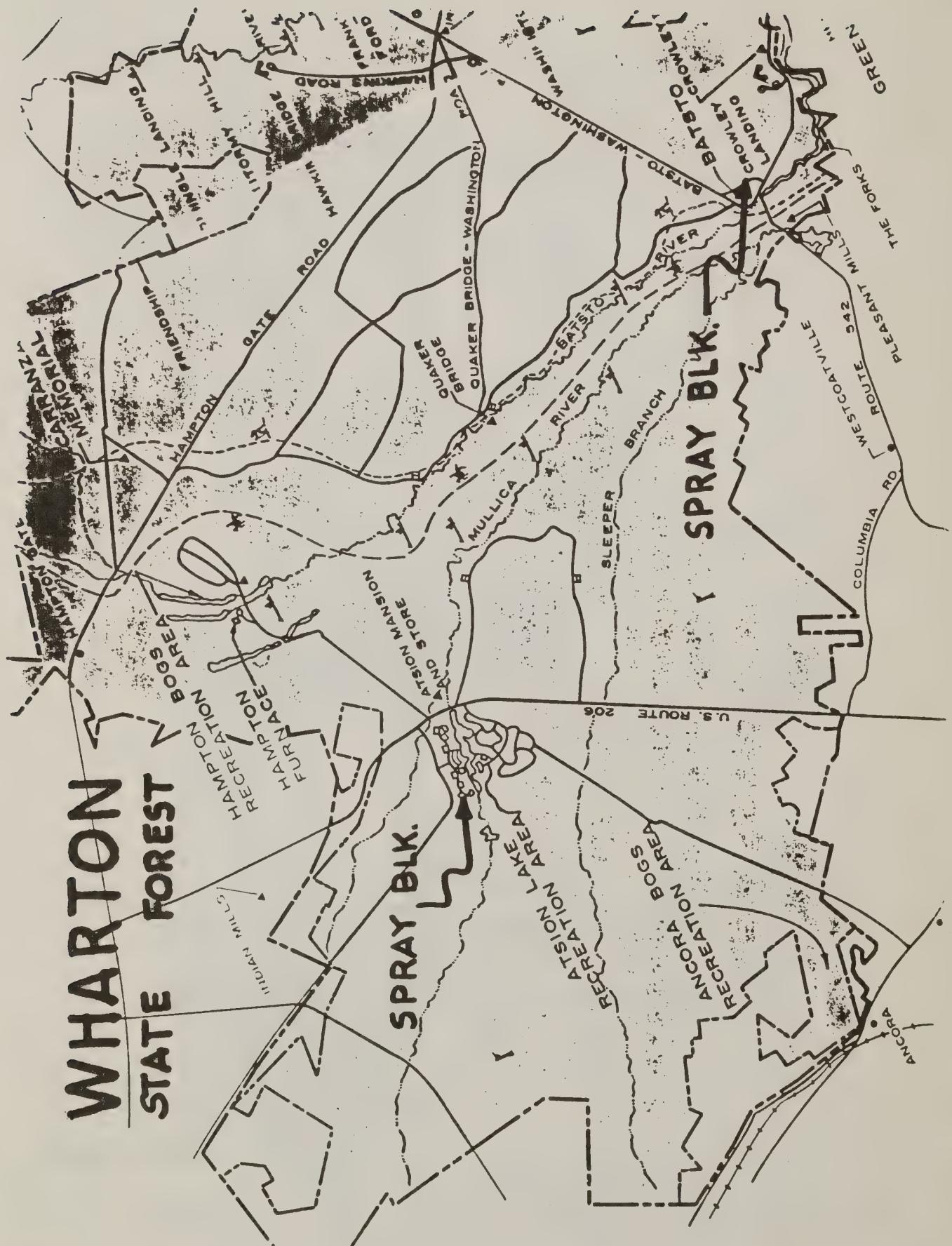


Table 2.--Gypsy Moth Suppression Project, New Jersey Forests and Parks - 1985

State Forest/Park	Total Acreage	County	Acres Scheduled for Treatment	Percent of Total Acreage
Allaire State Park	2,986	Monmouth	1,824	61.00
Bass River State Forest	18,208	Burlington	126	0.60
Belleplain State Forest	11,679	Cape May	776	6.60
Parvin State Park	1,125	Salem	525	46.70
Ringwood State Park	4,286	Bergen/Passaic	2,631	61.40
Wharton State Forest	<u>108,773</u>	Burlington	<u>118</u>	0.11
TOTAL	147,057		6,000	

* Only 4 percent of the total acreage will be treated.

Selection criteria.--The policy of the Bureau of Forest Management is to treat state-owned forests and parks and other state agency forests that were defoliated during 1984 and are heavily infested and expecting heavy defoliation during 1985. Both the defoliation and egg mass surveys are used to determine which area should be treated. Primary emphasis is placed upon the egg mass survey using 500 egg masses per acre as indicative of a gypsy moth population level which will lead to extensive *defoliation. If treatment is not initiated, the population usually increases to much higher proportions until finally it enters a stage of collapse. It is important to treat building populations before any real damage can occur. Secondary emphasis is placed upon areas where there is a high probability of larval blow-in from adjacent infested areas.

The Bureau will consider allowing one year of 60-80 percent defoliation if the following conditions exist: 1) remote areas, 2) concrete evidence exists that the bio-controls are active and may well knock down a building population, 3) wherever there has been a recent release of parasites or predators by the New Jersey Department of Agriculture, Division of Plant Industry, and 4) where study plots have been established to collect data concerning some phase of the gypsy moth problem. If population levels remain high enough to cause a second consecutive year of defoliation, then treatment will be considered in order to prevent future tree mortality.

Once all the general areas have been identified for treatment, it becomes necessary to evaluate each forest or park in light of overall use patterns. The highest priority revolves around the high-use recreation areas. Next on the list are the high valued timber stands. Finally, outlying forested areas are considered for treatment. If funding is adequate, all areas within state lands that qualify are treated.

At other times a gypsy moth population may suddenly decline as a result of weather or bio-controls. In this case, a proposed treatment block(s) is dropped from the project.

Treatment Selection

Treatment type.--Aerial application of the EPA registered insecticide Bacillus thuringiensis (B.t.) will be applied at a dosage of 16 BIU's and a rate of one quart of Bt mixed in one or two quarts of water. A droplet size between 100-200 microns will be maintained. Flat fan nozzles of the 8003-8004 size will be used. Aerial application is preferred because of the small dosage possible using fixed wing or rotary type aircraft as a platform for insecticide delivery.

Selection criteria.--The insecticide Bt has been selected for use in the suppression project because of the following reasons:

1. Departmental policy has reflected the concerns of environmental groups and individuals regarding issues of human health.

2. Bt is more host specific to lepidoperous insects thereby reducing adverse impacts upon desirable insects such as parasites, predators, and wild or domestic honeybees.

3. Blueberry growers in southern New Jersey were fearful lest pollination of their crops be hindered due to high bee kill within the colonies temporarily placed on site. Severe economic losses could result if bees foraged within areas treated with insecticide(s) lethal to them.

4. Bt has achieved a proven track record of gypsy moth control in operational programs throughout the United States and Canada.

5. The phenomenon of target pest resistance to Bt in the near future is very low. Higher and higher dosages will not be necessary to achieve control.

6. The environmental safety of Bt is very high. The possibility of Bt mutating in nature to a form pathogenic to mammals is unlikely to occur since Bt has existed in nature for millions of years and yet maintains a narrow host-range of about 150 species out of one to two million species composing the insect world.

7. Because Bt is acceptable to a majority of New Jersey's citizens full funding for future programs via legislature action is probable.

8. Other departmental agencies in New Jersey will be using Bt for gypsy moth control. Organizational efficiency is enhanced since the same contractor can be utilized. Ground mixing crews, aircraft, and pilots can be interchanged to treat whatever spray blocks are ready.

Method of treatment.--The problem of suppressing gypsy moth populations in New Jersey has historically involved large acreages. The only feasible, most efficient, accurate, and least costly method of doing this has been to aerially treat infested forest lands.

The New Jersey Bureau of Forest Management will utilize fixed wing or rotary type aircraft in order to suppress heavily infested state forests and parks. The type of aircraft used will be one or several of the following:

Grumann AgCat, Piper Aztec, Beech D-18, Cessna AgTruck, and Douglas DC-3, Aerospatiale SA315B Lama, Sikorsky 55 or Bell 206B Jetranger II helicopters. Speeds will vary between 80 mph and 140 mph and swath widths between 100 and 200 feet.

Representatives of the Bureau of Forest Management and New Jersey Department of Agriculture will undertake calibration of all aircraft involved in the project. During suppression operations each load of insecticide applied is timed by use of a stopwatch. Any variations in acceptable spraying time is immediately discussed with the contractor's representative and corrections made to rectify the situation. Aircraft are recalibrated if necessary.

A certified applicator and pilots will be responsible for implementing the suppression project. The contractor and his employees shall present on demand any license, document, waiver, Airmens' Certificate, or other such associated proof of competency, relevant to the aeronautical services being provided. All aircraft used must be registered in accordance with the provisions of N.J.A.C. 16:56-1.1 et. seq. All vendors providing aeronautical services to the state must possess the appropriate license(s) as set forth in N.J.A.C. 16:54-1.1 et. seq.

Personnel from the Bureau of Forest Management will be in charge of marking all treatment blocks on the ground with kytoons. Personnel in the observation plane will guide the spray pilot(s) to each block and assure proper application within the target area(s). Personnel will also keep abreast of local weather conditions.

Radios that are on the Bureau of Forest Fire frequency within state vehicles are used as well as portable radios in each spray block and observation plane. When weather conditions are too bad for flying, communications are carried out via land phone between the treatment block supervisor and project leader at the airport.

Suppression activities will take place between May 10, 1985 and June 20, 1985.

Safety Conditions

The applicator is totally responsible for the storage, handling, and disposal of the insecticide. Only federally registered insecticides are used by the Bureau and applied specifically within the target areas. Aircraft will be used to apply the insecticide *Bacillus thuringiensis* to the foliage within the treatment blocks. This method will assure accurate dispersal throughout the block while at the same time reducing drift and exposure to nontarget areas.

A project work and safety plan will be developed prior to initiation of the project. The main points addressed include such topics as: operational plan, personnel and duties, layout of treatment areas, flight plan, notification of the FAA, aircraft emergency landing procedures, insecticide emergency drop zones, aircraft equipment requirements, pre-spray training, monitoring of insecticide within spray blocks, policy to reduce human exposure to insecticide, line of responsibility chart, and financial plan.

Benefit/Cost Analysis

The New Jersey Bureau of Forest Management has two alternatives: 1) take the necessary measures to protect the forest resource in the state via a suppression program, or 2) not do so which would be a negation of the legislative mandate of the people. The areas considered for treatment during the spring of 1985 were defoliated in 1984 and have high enough gypsy moth populations to cause severe defoliation in 1985.

It is recommended that funds be made available for the treatment of 6,000 acres of state-owned forests and parks. The total cost of the proposed project would be \$107,555 which the federal share would amount to \$26,889. After careful evaluation of all the alternative methods of control, the Bureau of Forest Management strongly advocates the use of the insecticide Bt because it will fulfill the project objectives of population control and foliage protection.

Past histories of gypsy moth infestations in New Jersey have shown that a substantial percentage of the oak species within a forest can be killed following two or three consecutive defoliations. Management plans for any specific forest or park are seriously disrupted to the unscheduled removal of dead or dying trees.

Severe gypsy moth infestations in Stokes State Forest and High Point State Park, Sussex County, during the years of 1978 and 1981 have resulted in substantial mortality to the oak growing stock. Forest resource plans have recently been completed for the above state lands. These plans were compiled using ground plots as the basis for acquiring inventory information. The data from the field sheets was stored in a computer for analysis. In High Point State Park approximately 2,544,136 board feet and 42,163 cords were killed by the gypsy moth. In Stokes State Forest about five million board feet and 30,786 cords were dead. In Stokes, 235,334 board feet and 7,412 cords have been salvaged. The remaining volume has deteriorated to the extent that it will be good only for firewood during future salvage operations. In High Point State Park, 2,119 cords have been salvaged. The value of the lost wood in both High Point and Stokes amounts to \$1,068,290. The cost of treating those additional areas that needed treatment in Stokes and High Point during 1978 and 1981 would have amounted to \$173,356. The benefit/cost ratio is seen to be 6:1 after reviewing these figures.

Studies in New Jersey have shown that oak mortality of 40 to 80 percent can be expected after two consecutive years of defoliation in an oak forest. ^{1/} The areas considered for treatment are comprised primarily of various oak species (red, white, black, and chestnut oaks) and contain an average of 10 cords of wood per acre. A loss of up to eight cords per acre is a reasonable prediction if a minimum of two years defoliation is allowed to proceed unchecked.

Table 3 presents the ratio of cost to treat 1,000 acres to the value of volume saved. Usually it might require two to five years for the maximum amount of volume per 1,000 acres to die, but treatment would not be necessary as long as a new cycle of infestation did not occur. Wood value used are derived from the homeowners firewood sale program on-state lands.

Table 3.--Benefit/cost ratio of value saved/cost of treatment.

Potential Mortality	Total Acres	Cords Lost per 1,000 Treatment Occurs	Dollar Value of Cordage Lost If No Treatment Occurs	Cost of Treatment per 1,000 Acres at \$12 per Acre 3/	Value of Wood Protected per 1,000 Acres Minus Treatment Costs	Estimated Benefit/Cost Ratio 4/
40%	4,000	5/	\$40,000	\$12,000	\$28,000	1 to 3.3
50%	5,000		50,000	12,000	38,000	1 to 4.2
60%	6,000		60,000	12,000	48,000	1 to 5.0
70%	7,000		70,000	12,000	58,000	1 to 5.8
80%	8,000		80,000	12,000	68,000	1 to 6.6

1/ Kegg, John D. Oak mortality by repeated gypsy moth defoliation in New Jersey. Journal of Entomology - Vol. 66, No. 3, 6/73.

2/ Based upon cost per cord to public in the Bureau of Forest Management's homeowner firewood sales.

3/ The average cost per acre for the entire spray project.

4/ Found by dividing the cost of spraying per acre into the value of the cordage lost.

5/ 40% mortality x 1,000 acres x 10 cords/acre = 4,000 cords mortality. Cordage that would be lost if no spraying occurs.

If the dead cordwood were sold commercially, it could sell for \$25/cord so that the ratio of values saved/treatment costs would be even higher. Essentially, it is not unreasonable to consider a value of 5:1 as a realistic benefit/cost ratio for the proposed gypsy moth suppression project.

If any cost/benefit statement, consideration must also be given to the aesthetic benefits gained by protecting important recreational areas. Although no exact dollar values can be placed upon these benefits, nevertheless, they are present. Mass defoliation and subsequent tree mortality is bound to have a negative effect upon the public's enjoyment of state-owned forest resources. Tree stripping and mortality destroy the pristine beauty of the outdoors, and massive voracious hordes of caterpillars present during severe defoliation will ruin any attempt at using these outdoor resources. Therefore, aesthetic benefits must be considered as important as, and in addition to, dollar values of lost forest products when discussing a spray program.

Scoping Activities

A scoping meeting was held on December 17, 1984, in the Office of the Commissioner of the Department of Environmental Protection. Approximately 55 individuals and groups were informed of and invited to this meeting. A total of 21 people were in attendance of which five were representatives of environmental groups, ten persons from State of New Jersey agencies, two people from APHIS, and the remainder from shade tree and park commissions and one aerial applicator. Listed below is a list of the attendees:

New Jersey State Government

Name Organization

J. Kegg N.J. Department of Agriculture
W. Metterhouse N.J. Department of Agriculture
L. De Blois N.J. Department of Agriculture
L. Alpaugh N.J. Bureau of Forest Management
G. Koeck N.J. Bureau of Forest Management
W. Murawski N.J. Division of Fish, Game, & Wildlife
R. Kent N.J. DEP Mosquito Control
K. Buidner N.J. DEP Mosquito Control
R. Zampella N.J. Pinelands Commission

Federal Government

Name Organization

G. Vanech USDA - APHIS NY, NY
H. Mumma USDA - APHIS McQuire, NJ

Environmental Groups

Name Organization

S. Weiss Evesham Twp. Environmental Commission
M. Hanley Evesham Twp. Environmental Commission
J. Nagaki Evesham Twp. Coalition Against Toxics
S. Shaw N.J. Coalition for Alternatives to Pesticides
P. Twerdowsky Highlands Watershed Association

Other Attendees

Name Organization

C. Fletcher Bergen County Parks
D. Shaw Monmouth Co. Shade Tree Commission
J. Walton Monmouth Co. Shade Tree Commission
D. Nixholm Downstown Aero Crop Service, Inc.
J. Huhn Zoecon (Sandoz) Corporation

The scoping meeting lasted about two hours. Short presentations were given by the state representatives from the Departments of Agriculture and Environmental Protection. Program objectives were outlined and proposed treatment programs for 1985 discussed. Mention was also made of the manner of application and insecticide that will be used. Following the dissemination of this information, discussion was invited from the group. Only those individuals representing the environmental groups gave a 10-15 minute presentation.

All environmental groups were unanimous in their approval of DEP's decision to use Bacillus thuringiensis during future suppression programs and were complimentary in praising the change from Sevin to Bt during the 1984 program.

There were no issues or concerns raised at the scoping meeting regarding the 1985 gypsy moth suppression project within the state forest/park system; either in whole or part.

AFFECTED ENVIRONMENT

Host Vegetation

Treatment will take place in state forests and parks situated throughout New Jersey. The predominant species that are present belong to the oak type. Red, white, black, and chestnut oaks represent the majority of species within the spray blocks. The average size of the oaks is 12" diameter breast height and the average age is 85 years old.

Potential Treatment Sites

The predominant feature of all the spray blocks is that they are uninhabited with many miles of improved and secondary roads and trails running through them. What structures exist are administration and maintenance buildings.

Most people who use the state lands in which treatment is scheduled congregate in and around the cabins, campsites, picnic areas, lakes, and beaches which are interdispersed among the forest canopy. These recreation areas are mostly unoccupied during the weekdays when spraying can be expected to take place. No treatment will occur on weekends or holidays when these high-use areas are in demand. A smaller percentage of visitors enjoy hiking or just driving around a forest or park to appreciate the aesthetic values.

At the time spraying takes place it is most likely that the only persons inhabiting the treatment areas will be Bureau's of Parks and Forest Management personnel. These people will be directly involved in marking the perimeters of the spray blocks with helium filled balloons and undertaking monitoring activities related to proper coverage and droplet size of the insecticide. In the final analysis, the population density of all the treatment areas proposed in the three state forests and threee state parks can be identified as averaging no more than five people per acre.

Non-Target Organisms

Wildlife.--Treatment will maintain a favorable environment for wildlife within the spray blocks, especially birds and fish. Technicians of the New Jersey Division of Fish, Game, and Wildlife point out that defoliation caused by the gypsy moth will affect wildlife in the infested areas. Some species such as squirrels and birds leave the stripped areas because of lack of food and cover, while other species such as game birds move into the areas due to the emergence after defoliation of ground weeds, etc., which they use as food. Squirrels, chipmunks, birds, wild bees, fish, raccoons, turtles, mice, moles, voles, and owls may exist in some of the spray blocks.

Several species of wildlife that are on both the threatened and endangered lists thrive in habitats not conductive to gypsy moth attack. The Pine snake, Corn snake, and Pine Barrens tree frog are inhabitants of the coniferous forests in southern New Jersey. Regional zoologists with the Endangered Species and Non-Game Program of the new Jersey Division of Fish, Game, and Wildlife do not feel that the gypsy moth suppression project will be detrimental to any of the species on their lists since treatment is concerned primarily with the oak species.

Insect parasites and predators of the gypsy moth will in some areas be indirectly adversely affected by the spray program. Programmed population reduction of the host species; namely Lymantria dispar, will in turn result in a decreased prey population on which the biocontrols can thrive. Unfortunately, even if surveys indicate a high level of parasite activity with any of the spray blocks, the scientific tools are not available to predict adequate gypsy moth control. Certainly if this were possible treatment with Bt would be unnecessary and a waste of economic resources.

Plantlife.--All the proposed treatment sites will be examined by personnel from the New Jersey Office of Natural Lands Management. The direct effects of the aerial application of Bt on individuals of endangered or threatened plant species are currently not known. It is assumed that Bt has no herbicidal effects so that adverse reactions are not probable on the growth and reproduction of threatened

species. Unfortunately, the reproductive biology of most of New Jersey's rare plant species is poorly understood or unknown altogether. The beforementioned office is not opposed to gypsy moth control programs in any of the proposed areas. In addition, to eliminate all controls in severely defoliated areas may be more detrimental to rare plant species than treatment. Elimination of the forest canopy could lead to changes in the critical habitat of rare plant species resulting in mortality. But because of the limited knowledge of such species, no clear statement of the short and long term effects of this suppression program can be made at this time.

Geography

The proposed treatment areas in Bass River, Belleplain, and Wharton State Forests and Parvin State Park exist on what is very nearly a flat level plain with an occasional 20'-40' elevation change. The soil is predominately sandy with a general drainage sloping south and east toward the Atlantic Ocean. The spray blocks lie wholly within the Coastal Plain Province where soils are derived from unconsolidated beds of clay, marl, sand, and gravel of marine origin.

Allaire State Park is situated in a sparsely settled, semi-rural but potentially urban area. The park is situated in New Jersey's Outer Coastal Plain. Its soils and landforms range from wet lowlands of silt and organic material along the Manasquan River to dry upland areas of well defined beds of sand and gravel.

The park has an interesting terrain formed by differential erosion of coastal plain soils and varies a total of 135 feet in elevation. To the south and west, erosion has formed a steep ridge line parallel to the Manasquan. On the north, land slopes are more gentle and much less marked by gully development. Adjoining the stream valley are open meadows and wooded areas well suited to recreational use.

Allaire State Park is situated at the northern end of the "pine barrens" region of New Jersey. And since the park is located in the southeast evergreen forest, plant species characteristic of the deciduous forest region to the north are found here as well.

The park is divided into three environmental areas: flood plain, forested uplands, and meadows. It is in the uplands that a dense forest approaching an oak-hickory association is found with some areas advanced to a nearly pure hardwood stand.

Ringwood State Park is situated in topography considered to be steep and hilly. There are two main ridges running roughly along a north-south axis. Both are characterized by rocky precipitous slopes and ridges steeper than 45 F. There are several small ponds to be found throughout the park and the main recreation area is located adjacent to Sheppard Lake at the northernmost portion of the park.

Most of Ringwood is heavily forested. Typical hardwood forests of oak and maple occur most commonly. Conifers are represented with hemlock in the lowlands and eastern white pine scattered on the hills. In the Skylands section a variety of planted evergreens are found, Norway spruce being the most common.

Sections of the park contain large grass fields, some of which are surrounded by botanical gardens.

Streams generally flow south between the ridges and are represented by the Wanaque River in the western part of the park and the Ringwood River which flows through the Ringwood Manor Section of the park at lower elevations.

ENVIRONMENTAL CONSEQUENCES

Environmental Effects

Beneficial Effects.--The purpose of the suppression project is to preserve and perpetuate the forest resource while at the same time providing an environment conducive for the public's recreational enjoyment. Species of oak that range in age from 50-125 years old could be killed due to excessive defoliation. Spraying will prevent foliage loss and reduce gypsy moth populations to levels which may be controllable by natural means. Loss of a high percentage of the oak species will seriously disrupt management plan

objectives. It will create conditions in which the forest floor is exposed to direct sunlight. Much herbaceous material will be stimulated to grow thereby greatly increasing the forest fire fuel loading capacity per acre. As a result, the number of forest fires are increased, and these fires spread more quickly and are more difficult to control effectively. Also, the extinction costs are greater for fires that burn through the litter and into organic matter.

Adverse Effects.--This subject is best covered by making reference to page 68 in the USDA Final EIS as supplemented-1985 entitled Biological Insecticides. Bacillus thuringiensis is such an insecticide. In essence, the "USDA has found no reports of adverse effects attributable to the biological insecticides. The scientific data is replete with studies describing the safety of these materials to non-target organisms." Also, no human health uncertainty was raised during New Jersey's scoping session held November 17, 1984.

As mentioned before, the only adverse effects would revolve around host reduction of the parasite and predator populations dependent upon the gypsy moth for survival.

Irreversible or Irretrievable Commitment of Resources

Throughout all phases of the gypsy moth program, forestry personnel are called upon to fulfill various responsibilities. State land foresters participate in collecting egg mass data on over 116,000 acres of state forests and parks. During the actual suppression project, these same personnel act as block and airport supervisors. After completion of the project, a post-suppression survey is also completed by forest management personnel. When the entire project is considered; aerial and ground surveys, reports, training, etc., about 237 person days are spent. All the time involved in carrying out a successful gypsy moth suppression project could be channeled to other projects within the Bureau, particularly the completion of management plans.

Human Health

At the present time there does not exist any scientific evidence that the use of Bt will adversely impact upon human health. There is some literature suggesting problems with eye ulcers if the Bt is splashed in a person's eyes. Also, there is one instance of a finger infection following puncture with a needle containing Bt-H14 spores. These are indeed isolated cases and should not be generalized to whole populations without a firm scientific foundation of research to draw upon.

ADMINISTRATIVE REQUIREMENTS AND CONSTRAINTS

Guidelines for Local Participation

The Bureau of Forest Management does not require townships, borough, county, or other local government participation to initiate a suppression project within state forests and parks. Programs receive their inputs from state agencies within the Department of Environmental Protection. Forestry personnel act upon requests made by regional supervisors, park and forest superintendents to evaluate, and if need be, plan suppression measures on state lands.

State responsibilities.--Personnel from the Bureau of Forest Management attend public meetings sponsored by the New Jersey Department of Agriculture. The gypsy moth suppression project is outlined and public participation is encouraged to discuss all problems brought to surface.

A scoping session is held each fall preceding a suppression project. Representatives from the state agencies are present. Concerned citizens and environmental groups are invited to attend. The various suppression measures in New Jersey are outlined. Questions of clarification are encouraged. While a debate situation is not part of this meeting both sides of the spraying issue are presented. The purpose of the session is to solicit issues and concerns not already addressed in the current USDA Environmental Impact Statement. Issues and concerns local to the proposed project are considered on the development of the Bureau's suppression plans. The Bureau of Forest Management's

responsibility is to provide all information concerning its proposed suppression project in time to have the USDA Forest Service include such material in the 1985 site-specific Environmental Assessment.

Local responsibilities.--There are no local responsibilities regarding public involvement for the 1985 suppression project since all treatments will take place within the state forest and park system. Township officials and local police will be informed of treatment within state lands so that concerned citizens who call may receive knowledgeable answers as to what, where, how, and when treatment will be undertaken.

Public Notification

People who plan on using a state forest or park should rightfully have the opportunity to avoid treated areas if they so desire. Likewise, residents of homes, hospitals, retirement communities, schools, nature centers, etc., must also be made aware of impending suppression activities so proper measures can be completed according to individual needs.

State responsibilities.--Several months preceding the start of a suppression program the Department of Environmental Protection initiates a public information program concerning the impending suppression project. A news release is made available to newspapers, radio, and T.V. which outlines the objectives of the suppression project and the location of the proposed treatment areas.

The New Jersey Office of Pesticide Control has mandated that the following steps be followed to satisfy the notification process relative to proposed area-wide applications.

1. The notification shall be made through advertisement in at least two newspapers having the greatest likelihood of informing the public within the area of application.
2. The newspaper notification must be given a maximum of 60 days and a minimum of 7 days prior to the proposed application date.

3. The notification must contain at least:
 - a. the proposed application date;
 - b. the location of the application as determined by the information available at the time the decision to notify is made;
 - c. the name, address, and registration number of the applicator, business, or the responsible pesticide applicator associated with the application;
 - d. the brand name and active ingredients of the pesticide(s) to be used;
 - e. application equipment to be used; and
 - f. the name, address, and phone number of a contact person who is responsible for supplying updated information on the advertised pesticide applications to those persons requesting it.

4. Any persons residing in the vicinity of the proposed target site requesting additional updated information may contact the designated person in 3.f. The updated information requested may include:

- a. the actual time and date of application;
- b. the actual pesticide to be applied including the EPA registration number; and
- c. any precautionary statement(s) on the product's federal registered label.

5. The contact person shall call the individual requesting the updated pesticide application information and supply that information at least 12 hours prior to the application, but if the attempt to contact is unsuccessful, an additional attempt immediately prior to the application shall be made.

6. The contact person shall maintain a record of all telephone calls, attempted and completed, with persons requesting the updated information and a file of related correspondence received and shall make these available to the Department upon request.

Maps of the treatment blocks are posted in forest and park offices and bulletin boards several months prior to actual spraying.

Since public concern over spraying in New Jersey is real, the Bureau of Forest Management will provide a means for people to avoid being sprayed in one of the following ways:

- a. When people obtain their camping or picnic permits at a park or forest office, they will be informed of an impending suppression project.
- b. If a morning treatment is planned, rangers will notify park or forest users on the prior evening. If treatment is planned in the evening, rangers will notify park foresters one hour prior to actual treatment. This will give people an opportunity to leave the area.
- c. By order of the Governor or Environmental Commissioner, a forest or park can be closed to public use prior to, during, and after treatment operations.
- d. Signs will be posted at intersections of trails and major roads to notify hikers they are entering a proposed treatment area and where they can obtain more information as to the appropriate date of treatment, maps, etc.

Local responsibilities.--Since the proposed project will take place on state land, there are no local responsibilities concerning public notification. Local officials and police will be notified of treatment on nearby state lands so that they are able to respond to residents who may make inquiries.

Precautionary Measures and Constraints

In carrying out a suppression project, the most important aspect will be to assure the accurate application of the insecticide at the exact dosage rate within the target area as safely as possible. Detailed planning must precede each treatment of a spray block to assure the successful attainment of objectives while maintaining the integrity of state and federal laws. The project work and safety plan covers this aspect of the suppression project more fully and will be developed prior to implementation of the project.

The specific precautionary measures that the Bureau of Forest Management considers important to fulfill throughout the 1985 gypsy moth suppression project consists of the following:

Application constraints.--The application of Bacillus thuringiensis (B.t.) will follow all label instructions and regulations as well as adhere to federal and state laws. It will be applied at a dosage of 16 B.I.U. per acre at a rate of one quart B.t. mixed with 32-62 ounces of water and two ounces of sticker for a finished mix of 64-96 oz. per acre.

During the period of the spray program (May 10 - June 20), Bureau of Forest Management personnel will be alerted to all factors which will directly affect quality control. Operating hours will normally occur between 5 a.m.-10 a.m. and 4 p.m.-7:30 p.m. when wind conditions are not in excess of 10 mph, surface temperatures not above 70 F, and the foliage dry and expected to remain so for at least 12 hours following application.

The pilot of the application plane must exhibit the skills necessary to apply the insecticide accurately within the target areas(s) and maintain the proper functioning of all spray nozzles during application in order to maintain correct and constant spray calibration.

On the ground, the proper mixture of the insecticide shall be maintained in the mixing tanks, and the insecticide will not be allowed to remain in an aircraft for more than 24 hours without being drained and re-agitated in the main mixing tank.

An observation plane must always be available to guide the spray plane during application, otherwise the spray plane will not be cleared for takeoff. All aircraft used during the suppression project will fly approximately 50-75 feet above the forest canopy.

Designation of the treatment blocks will be achieved by using kytoons, bright orange helium-filled balloons. In a large treatment block, smaller segments are marked off by using road intersections, fields, or mountain ridges. The aerial applicator uses these kytoons in addition to USGS topographical maps upon which are marked the appropriate

kytoon sites and treatment block boundaries. Areas within a treatment block that are considered sensitive; lakes, streams, buildings, etc., are circled in red to alert the pilot that they are not to be treated. Before application takes place, the state's representative will take the spray pilot over the treatment area(s) on a pre-treatment orientation flight.

A communications system will be used so that all personnel involved in carrying out the suppression project will be able to speak with one another. Focal point of the communication system is use of the New Jersey Forest Fire Service vehicle based and portable radios. Also, there is plane to plane contact on assigned FAA radio frequencies. The project leader can talk to the block supervisor, ground crews, and spray plane using these radio systems. In this way, maximum information is maintained regarding treatment block and airport weather conditions and target control during the actual time of application.

Environmental constraints.--Any sensitive areas such as lakes, rivers, ponds, and beaches will have a 100 feet buffer zone established between the end of the treatment block and the area to be avoided. Also, hospitals, nursing homes, and schools adjacent or in the vicinity of the treatment block are avoided as much as possible during spraying operations. These are also marked upon USGS maps for the pilots attention. The aerial applicator is instructed to plan his application and turns so that noise pollution is kept to a minimum.

Human Health

In recent years the public has become more concerned over the use of insecticides. The proposed suppression program of 1980 was cancelled by the New Jersey DEP Commissioner following controversy over the insecticide then in use.

During the spring of 1984 a Departmental decision was made to abandon the use of Sevin and instead rely upon the biological insecticide B.t. As a result, the 1,478 acres treated in 1984 were sprayed with Dipel 6L and plans for future programs will incorporate B.t. in one formulation or another.

Because of the highly emotional issue involved, the Bureau of Forest Management has an obligation to present alternatives to people who feel strongly about being in a spray block when spraying is taking place. Users of park or forest facilities are notified at the administration office as to probable spray dates. Signs are posted along major roads and intersections of roads and trails. Rangers visit all recreational facilities and notify people that treatment is imminent so that they may leave if so desired.

Within some of the forests or parks high use recreation areas are avoided if evening treatment is scheduled. Instead, these areas will be treated early in the morning when there is a less likely chance of human exposure. Also, no treatment will take place on Friday evenings, weekends, or holidays in any high use recreation area.

The public is not permitted at mixing or loading sites. Members of the ground crew who represent the aerial applicator follow the safety procedures that are policy with this Department's Office of Pesticide Control. Guidelines of the applicator's insurer are also enforced.

If the mixing crew or pilots wish to wear goggles and/or gloves to avoid eye inflammation if the B.t. is splashed into the face or gloves to reduce risk of skin infection if cuts are present, that will be their responsibility.

Persons within the spray blocks need not take any precautionary measures because the biological insecticides are considered environmentally safe and are not known to present any risk to human health.

In case of an accidental excessive exposure, the person(s) so affected will immediately be driven to the nearest hospital or medical aid station. Since area foresters are directly involved in all phases of the suppression project, they are acquainted with the locations of medical aid in their counties. In addition, radio contact is maintained with an ACTION LINE dispatcher in Trenton who could make the appropriate calls to bring medical personnel or state police to the accident scene.

If an individual in the public sector felt the need to report an insecticide incident, he would call the Trenton ACTION LINE number which could be obtained from any

telephone operator. The dispatcher, which is on duty 24 hours a day, 7 days per week, would then make the appropriate calls to the Department of Hazardous Management. A special SPILL UNIT would travel to the site for investigation.

Performance Monitoring

In order to assure the successful attainment of the suppression objectives, various guidelines for application and environmental monitoring will be followed. When considering safety, accuracy, efficiency, and the economical use of time and money, it is important to consider the processes by which monitoring will be achieved.

Application monitoring.--Various personnel from the Bureau of Forest Management are always present to assure that the insecticide is properly applied to the target area(s). Foresters act as supervisory personnel at the airport during loading operations, in the treatment blocks as monitors, and in the air as observers.

A Cessna 172 is used for chase plane and communication duties. Weather permitting, the project leader will fly from the base airport to the spray block. He will then communicate with the block supervisor via portable radio to ascertain weather and other relative conditions for spraying. Once a decision is made, the project leader will call back to the airport supervisor via portable radio to either load up or hold the spray plane on the ground. If the spray plane takes off, the chase plane will direct the proper swathing, check the nozzles, and calibrate the spray plane during operation. Communications between project leader and spray plane pilot is maintained via plane to plane frequency radio.

The block supervisor is the man on-site in the spray block(s). All personnel in the Bureau have had several years experience fulfilling this duty. It is his responsibility to be aware of and so notify the project leader as moisture, wind, fog, clouds, etc. are recorded in order to determine if spraying can or cannot take place. The project leader is notified of weather conditions in a spray block via ground to air in the chase plane or ground to ground via land phone, from the block to the airport.

Based upon the weather and other conditions occurring in a

block, it is the project leader's responsibility to decide whether or not spraying should or should not take place.

Drift of the insecticide will occur when either the wind becomes too high (above 10 mph) and/or the surface temperature causes the insecticide to rise rather than gravitate on the forest foliage. Essentially, drift is monitored from the chase plane. Rising insecticide will accumulate on the windscreen of the chase plane. Excessive winds can be seen by observing the tree tops while in flight and/or being so informed by the block supervisor on the ground who uses a wind gauge to monitor wind speeds.

During the actual spraying operation, the spray pilot is guided from the chase plane within each block. Care is taken to assure that he maintains the integrity of the target area and does not spray outside its perimeters into either buffer zones or no-treatment areas. By the use of kytoons, natural features, maps, topography, and guidance from the chase plane spraying accuracy can be maintained.

Personnel from the Office of Pesticide Control will monitor the contractor's compliance with state constraints regarding application and also the transportation, mixing, and loading phases of the project. Personnel from that office will follow their own policies and guidelines in these matters.

Environmental monitoring.--The majority of environmental questions relating to the use of the insecticide B. t. have already been addressed in the 1984 Final EIS. Therefore, the Bureau of Forest Management does not anticipate any detrimental side effects to the environment. However, Bureau personnel will be on guard for signs indicating any abnormal or unexpected incidents. If, for example, there was an emergency drop due to a mechanical problem in the spray plane, then appropriate action would be undertaken to determine if adverse effects might be caused by the insecticide.

The block supervisors will monitor and evaluate both leaf expansion and larvae development within each proposed spray block.

It is probable that spraying will commence in southern New Jersey about May 10, 1985. When leaf expansion is about 50 percent and the larvae are all in the first or second instar, treatment may commence.

Pre-treatment gypsy moth populations will be evaluated in terms of larvae hatch, signs of parasitism and collapse. If the expected level of infestation is not realized and falls below the minimum criteria, then treatment will be cancelled for that specific block.

Post treatment of gypsy moth populations will take place using a five-minute larvae count method while walking on a compass bearing. After ten days, larvae should no longer be encountered.

About a week following treatment a ground and/or aerial inspection will be made of the spray block(s). If it is evident that there have been some misses and larvae are still feeding unabated, then retreatment will seriously be considered.

The project leader will be in contact with Bureau headquarters in Trenton daily following the conclusion of spraying each day. This is an opportunity to evaluate all aspects of the program and make the necessary phone calls, changes, and notifications if the situation dictates. Any problems concerning the environment can be addressed and the appropriate specialists contacted to resolve issues.

Pennsylvania Department of Environmental Resources
Cooperative Gypsy Moth Suppression Project - 1985

INTRODUCTION

Gypsy Moth Status

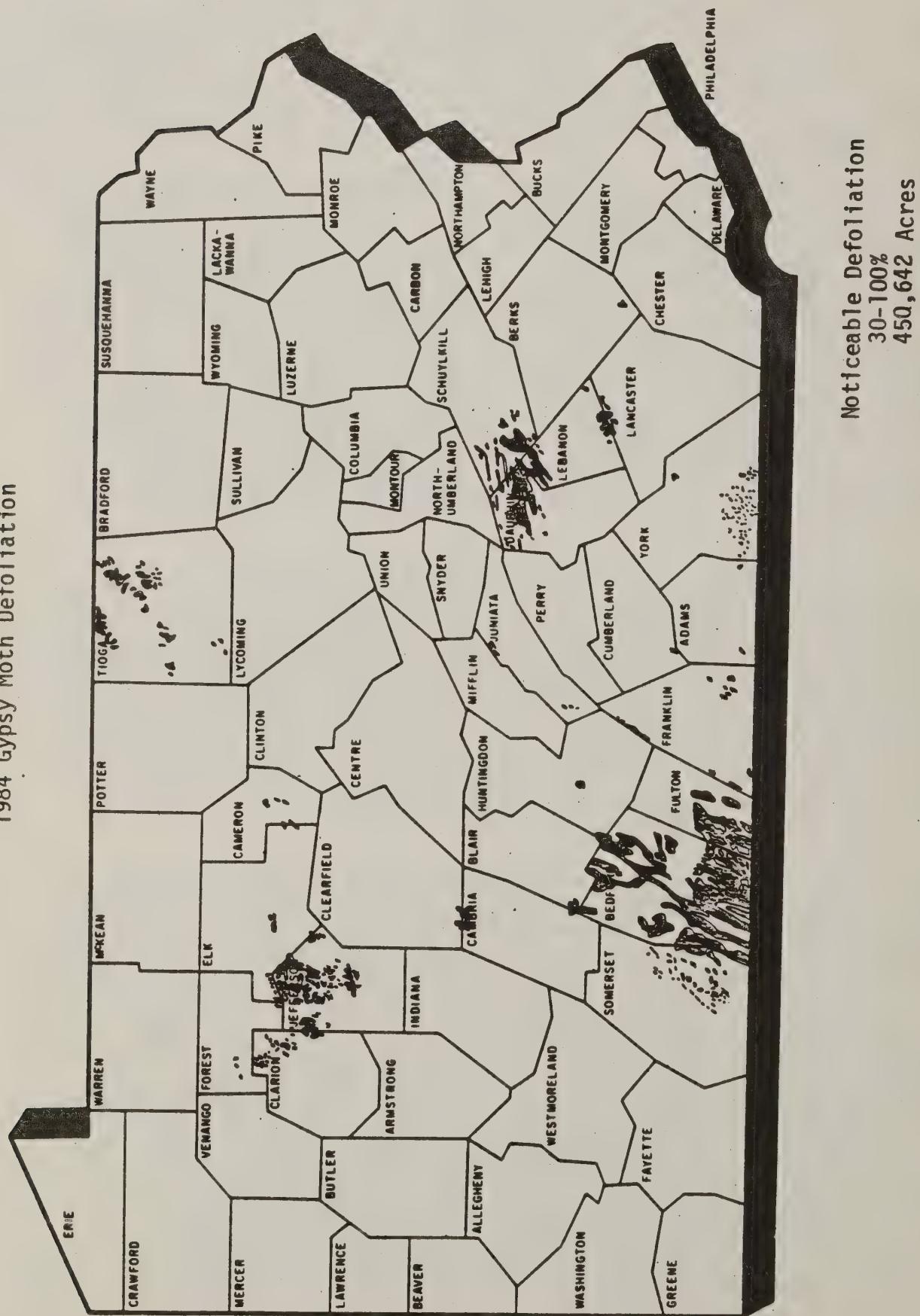
Gypsy moth caused defoliation state wide in 1984 totaled 450,642 acres. This figure is one-third of the 1983 total and is the third successive year of significant reductions since the 2.5 million acres defoliated in 1981. Serious infestations are present or have occurred in 56 of Pennsylvania's 67 counties as the spread continues southward and westward. As the natural cycle of the gypsy moth continues, the prediction for 1985 is for the defoliated acreage in the state to reverse the present trend and start to increase. Estimates for the 1985 defoliation range from 500,000 to over one million acres. The extent of the predicted increase will be dependent primarily on the amount of resurgence in the eastern half of the state that has been stable for the past two years. The principle movement of the insect is toward Maryland, Virginia, and West Virginia, but sizable advances are also being made toward Ohio.

For the second year the primary insecticide used on private land was Bt (Bacillus thuringiensis). The acreage treated with Bt was 140,723 acres. Some of the Bt was applied at 20 BIU's per acre, but the majority received a single application of 12 BIU's. The remainder of the spraying, which was on state and federal lands totaled 144,249 acres, was treated with Dimilin W-25 or Alsystin. The total program involved the treatment of 284,972 acres of land distributed across portions of 37 counties and contained in 2,002 spray blocks. The spraying was done by five aerial applicators using 25 helicopters starting on May 9 and finishing on June 11. The spray program cost to the state was \$3.2 million which averaged out to \$11.24 per acre.

The overall results of the spraying operation were considered good for both the Bt and the Dimilin treatments. The start of spraying was delayed by unusually cold weather in late April and early May. This cold weather delay may have been good in the long run because we didn't spray as early as in 1983 and the overall results were better. Also the caterpillars were more actively feeding during and right after spraying than in 1983. Our treatment evaluations were based on foliage protection by comparing treated and untreated areas at peak defoliation. The results indicate that one application of 20 BIU's per acre kept defoliation averages of favored host tree species to less than 30% even in healthy populations of up to 5,000 egg masses per acre. No conclusions were drawn from the 12 BIU treatments due to the small sample size and the overall population collapse in the untreated check areas. All the Dimilin was applied at 2 oz. of formulation in three quarts of water per acre. The results are directly dependent on the quality of the application. There appears to be no need to increase the amount of Dimilin, but increasing volume of solution per acre may help to improve coverage.

PENNSYLVANIA
1984 Gypsy Moth Defoliation

Figure 1. Gypsy Moth Defoliation, State of Pennsylvania, 1984



Purpose and Need for Action

When an area is invaded by gypsy moth two major things happen. Hordes of caterpillars crawling over everything makes normal outdoor activities unpleasant or nearly impossible. The added stress of defoliation makes some trees susceptible to invasion by other insects and diseases which later kill the tree. The need for this spray program was expressed by citizens to their legislators, the Governor and others, as a demand for help. Recreational areas loose their attractiveness to visitors and economic losses in tourism, sales and resource values quickly follow.

Private land treatment is confined to high-use areas, primarily the properties of people who reside in forested areas. More treatment of public land has developed in response to an increasing timber mortality rate following gypsy moth defoliation. For the second year the acreage requested for spraying on public land exceeds the acreage requested on private forested residential areas.

PROPOSED PROJECT

Project Statement

The Pennsylvania Department of Environmental Resources (DER) in accordance with the Final Environmental Impact Statement (FEIS)¹, proposes to use biological and chemical insecticides, in an integrated pest management approach to suppress gypsy moth populations. The project will involve direct suppression activities on 212,000 acres of state and private land located in portions of 29 counties in the central two-thirds of the state. The size of the final program will be dependent on the amount of state and county funds appropriated.

Organization

DER, by authority of Act Number 275, Section 1902-A of the General Assembly, effective January 19, 1971, has the responsibility for protecting all forest land in the state from forest insects and diseases. To achieve its mandate the Division of Forest Pest Management has a general policy of conducting suppression projects in areas in need of treatment, if such practices can be economically justified and performed without significant adverse side effects. Treatments may be carried out by various methods, including spraying with chemical or biological pesticides, release of other biological agents, silvicultural practices or salvage operations. The Department, (DER), as a general rule, will not use, or recommend the use, of any large-scale application of chemical pesticides on the forest lands of the Commonwealth.² The policy adopted is to limit treatment to the protection of forested residential, recreational and high-value timber lands when insect densities are high enough to cause serious damage. Efforts to slow down the advancement of defoliating level infestations by treating large areas is considered only when properly justified and after approval of the Secretary of the Department.

¹Final Environmental Impact Statement; Gypsy Moth Suppression and Eradication Projects as Supplemented - 1985. Copies available from USDA- Forest Service, P. O. Box 2417, Washington, DC 20013

²"Statement of Policy by the Pennsylvania Department of Environmental Resources in the Control of Forest Pests," October 27, 1971.

The proposed project is the responsibility of the Chief of the Division of Forest Pest Management, James O. Nichols. The Supervisor of Control Operations, William R. Slippey, coordinates the planning and application of the spray materials. Their offices are located at 34 Airport Drive, Middletown, Pennsylvania 17057.

Objectives

Project objectives, types of areas to be treated, and responsibilities of the agencies involved can be found in a document titled, "Guidelines for Cooperative Gypsy Moth Suppression Projects", August 1, 1984.³ References made to this document in the remainder of this proposal will refer to it as the "Cooperative Project Guidelines." Because of DER's policy, treatments are generally restricted to areas highly used by the public and residents. The primary objectives of this type of program are: 1) prevent defoliation in excess of 30%; 2) prevent tree mortality caused or associated with the stress of defoliation. Secondary objectives are: 3) provide relief to the serious public nuisance caused by massive invasions of caterpillars; 4) reduce the gypsy moth population in the treatment areas sufficiently to prevent the need to retreat the same area the following year.

Biological Monitoring

Monitoring is a continual process taking place before, during, and after the treatment. Initial egg mass density estimates are made by personnel from a county or agency initiating the treatment request. From October through December, egg mass counts are made in all proposed treat areas. The standard technique used is the 1/40th acre fixed radius plot. When the survey does not result in the necessary average of 250 egg masses per acre, additional counts are made in areas adjacent to the proposed treatment area. This information is used to assess the potential for larval blow-in and migration. Post treatment egg mass counts are made in a percentage (10-25%) of the treatment areas during late August and September using the same survey techniques. This provides an estimate of the population reduction following treatment.

Sufficient manpower is not available to do systematic larval counts at even time intervals before and after treatment. General observations of live and dead caterpillars are made in a sample of the treatment areas 5-10 days after treatment. No attempt is made to quantitatively count larva, but rather estimate a ratio. Calls from citizens and local government officials usually alert DER of areas of inadequate control. Consideration of possible retreatment is given to areas where adverse weather followed soon after treatment. Field crews marking the treatment areas check for evidence of the applied insecticide by using spray deposit cards and checking smooth, dark colored surfaces.

³Copies are available at Pennsylvania Bureau of Forestry, Division of Forest Pest Management, 34 Airport Drive, Middletown, PA 17057.

Defoliation surveys are conducted each year at peak defoliation in late June to early August. Sketch mapping is done by aerial observers delineating all the areas with detectable defoliation and dividing them into moderate or heavy defoliation levels. The estimates are made by considering the favored food species in the stand. This is very easy in stands that contain a high percentage of oaks. Sketch mapping is supplemented with aerial photography, when available. The survey area contains all of the treatment blocks, but a precise defoliation determination from the air is not always made for each treatment block. Some of the treatment areas are visited on the ground in July to supplement the aerial defoliation survey date. A post treatment defoliation estimate is made from the ground by the monitoring teams in a percentage (10-25%) of the treatment areas. This is done by estimating defoliation levels of preferred host species and the overall stand.

Treatment Area

Locations - The proposed project will take place in the central two-thirds of the state. The treatment areas can be located anywhere that favored host trees are found, providing the other selection criteria are also met. The map in Figure 2 indicates the counties that plan to participate in the 1985 spray project. Detailed maps showing the individual treatment areas in each county are available for inspection at the Forest Pest Management Division Office in Middletown or at the District Forester's office that serves the particular county. The current tabulation shows there are slightly over 1,100 treatment areas in the plans. Table 1 provides an alphabetical listing of the participating counties with their planned private land acreage and the approximate total acreage to be treated on public land. There are two counties which are not participating in the cooperative program, but contain land that was proposed by a state agency. There are a total of nine counties that participated in the program last year, but will not be in the program this spring. There are two counties that participated in previous years, but not last year, that are back in the program. The list also contains four counties that are first time participants in the program.

Selection Criteria - The state is not involved with the selection of treatment areas on private land. The county or municipality makes the initial selection based on such criteria as requests from property owners, insect damage the previous year, egg mass densities readily visible, and availability of funds. A more detail description of involvement at the local county level is found in a later section under ADMINISTRATIVE REQUIREMENTS AND CONSTRAINTS.

The state selects treatment areas on state-owned land based on the previous year's situation, estimated insect condition for the following year, amount of public use of the area, value of the resource to be protected, estimated future losses if no action is taken and available funds.

To be included in the treatment program an area must: 1) be used by people for residential or recreational purposes or have some special use; 2) contain tree species susceptible to gypsy moth damage with a crown cover of at least 50%; 3) the treatment area must contain a minimum of

PENNSYLVANIA BUREAU OF FORESTRY
STATE FOREST DISTRICTS

1985 Gypsy Moth Spray Contracts

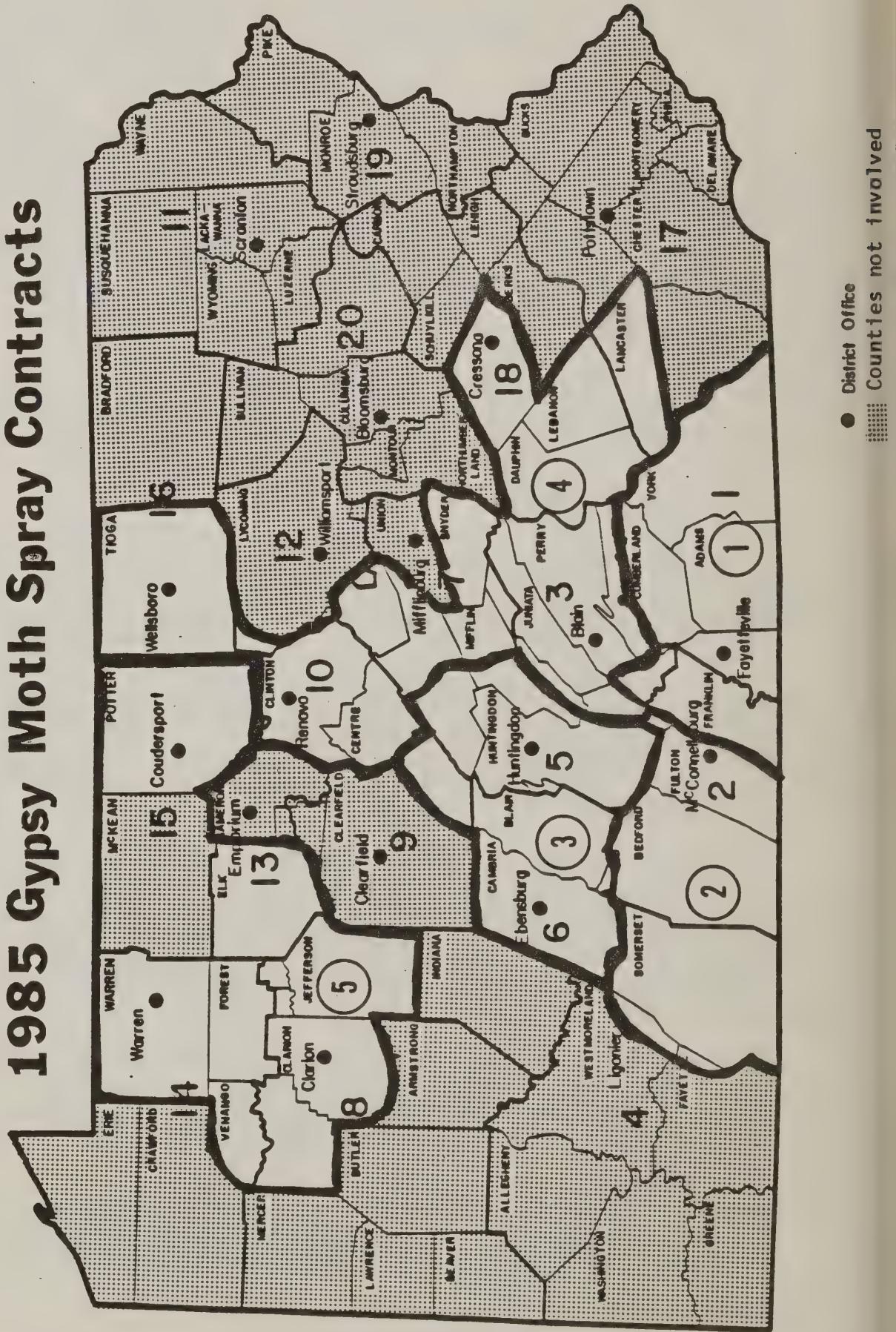


Table 1.--1985 Gypsy Moth Suppression Program in Pennsylvania

These figures are the acreages scheduled for treatment as of March 12, 1985. Some changes can and usually do take place before actual spraying.

I. Private Lands - cost sharing with the county

<u>County</u>	<u>Acreage</u>	<u>County</u>	<u>Acreage</u>
Adams	3,885	Jefferson	2,788
Bedford	7,500	Juniata	893
Blair	6,282	Lancaster	627
Cambria	4,270	Lebanon	1,884
Centre	5,606	Mifflin	652
Clarion	2,031	Perry	993
Clinton	65	Potter	182
Cumberland	3,308	Schuylkill	892
Dauphin	652	Snyder	1,203
Elk	186	Somerset	11,031
Forest	2,912	Venango	272
Franklin	1,444	Warren	2,931
Fulton	917	York	9,052
Huntingdon	820	5% Buffer	3,722
		Total Private Lands	77,000

II. State Lands - not supported by county funds

<u>District</u>	<u>Acres</u> <u>State Forest Lands</u>	<u>Acres</u> <u>State Park Lands</u>	<u>Acres</u> <u>Other</u>	<u>Acreage</u> <u>Total</u>
1	29,900	2,343	-	32,243
2	15,216	82	20	15,318
3	11,465	470	-	11,935
4	-	3,990	-	3,990
5	23,352	1,265	901	25,518
6	-	320	-	320
7	65	740	-	805
8	635	1,939	-	2,574
10	920	40	-	960
14	-	-	167	167
15	18,724	-	-	18,724
16	12,786	-	118	12,904
18	2,000	1,047	-	3,047
	115,063	12,236	1,206	128,505
			5% Buffer	6,495
			Total State Land	135,000

The two counties of Tioga and Westmoreland contain some state land scheduled for spraying but no county participation on private land.

III. The entire suppression program currently has a maximum acreage figure of 212,000 acres.

25 forested acres, with a few exceptions; 4) contain either 250 healthy egg masses per acre, or a reasonable expectation that high numbers of wind-blown larvae will invade the area; 5) be unsuitable for treatment with ground equipment. Private land areas that are excluded from treatment are: 1) undeveloped and uninhabited forest lands; 2) villages and communities or other areas containing scattered shade and ornamental trees accessible to treatment by ground spraying equipment; 3) areas where a biological collapse of the insect problem is evident; 4) areas where property owners are opposed to having their property treated; 5) areas that do not meet the minimum spray block size or other established criteria; 6) areas where the local government does not fulfill their responsibilities.

Treatment Selection

Treatment Type - To meet the short-term objectives of this project an integrated approach using chemical and biological insecticides was the selected treatment.

This project will be very similar to the treatment program conducted in Pennsylvania last year. Nearly all the private land and a portion of the State land will be treated with Bacillus thuringiensis (B.t.). The aerial applicators have chosen to work with the Abbott Laboratories product called Dipel 8L. Current figures show that B.t. will be applied to approximately 103,700 acres or roughly 49% of the program. The B.t. will be applied at two different rates. Approximately 71,700 acres or 69% of the B.t. acreage will be applied at 12 BIU's per acre in a final solution of 128 oz. per acre. The remaining 31% of the B.t. acreage, roughly 32,000 acres, will receive 20 BIU's per acre in a final solution of 128 oz. per acre. The 20 BIU's per acre rate will be used where the gypsy moth populations are healthy and building with egg mass densities of over 1,000 per acre. The remainder of the program, approximately 108,300 acres which is mainly State-owned land, will be treated with Diflubenzuron (Dimilin W-25) at a rate of 2 oz. of formulation in 128 oz. of water. The Dimilin is restricted to use in sparsely inhabited areas, but can also be used in campgrounds and on State Park lands.

Selection Criteria - The pesticide selection is a process for determining the best material available to accomplish the objective of the program based on details of the specific areas. Several criteria are used to evaluate the pesticides under consideration. First the following criteria must be met for a material to be considered: 1) the material must be fully approved by the USDA and the Pennsylvania Department of Agriculture; 2) the method of application must conform with label specifications; 3) the location of intended use must not conflict with any label restrictions. Final selection is based on a competitive comparison of: 1) biological efficacy; 2) environmental effects; 3) operational feasibility; and 4) economic analysis. The pesticide selection is not made by one individual but by a staff of people who draw upon information and recommendations from other Pennsylvania State agencies, various organizations, and the public.

Bt was selected for use by the Department in residential areas because of its demonstrated complete safety to humans and to the environment. Also, the public has indicated its preference for non-chemical spray materials in human-populated areas. Dimilin was selected for use on non-populated State Forest Lands because of its cheaper cost. Human populations are not a factor in the latter areas.

For the 1985 program, the chemical insecticide Dimilin W-25 was purchased by DER, and will be provided to the aerial applicators. The Bt on the other hand is being purchased by the contracted aerial applicators. The final selection from the list of approved products was their decision. They had to consider the cost of the product, handling capabilities and faith in the products past performance. As mentioned earlier, all the applicators chose Dipel 8L.

Methods of Treatment

All of the insecticide application in this project will be done aerially using various size aircraft equipped with conventional spray systems and flat fan type nozzles. The project will be divided into several contracts. Each pilot working on the program must be properly licensed and certified with at least two seasons of forest spraying experience and current medical examination.

All of the equipment will go through a calibration check conducted by DER personnel and insecticide company representatives. Initial calibrations will be done on the ground using water whenever possible. A monitor of the calibration during the application will be done by timing the dispersal of a known volume to compute flow rate. Spray droplet cards will be used to check droplet size and distribution. Swath width checks will be made on any equipment that is different from those used on previous programs.

During the application, DER personnel will be responsible for placement of the aerial markers, briefing the pilot each day and between loads, if necessary, and maintaining accurate insecticide use and spray time records. The contractor assumes responsibility for transporting the insecticide to the work site and proper transfer and metering into the aircraft. A two-way radio communication system will be established with the pilot using DER portable transceivers properly installed in the aircraft.

The project is anticipated to start during the first week of May and be completed by the second week of June. The timetable is governed by foliage development and caterpillar hatch which are both weather dependent. The spraying will start in the southern part of the state first and continue northward and to higher elevations as tree development progresses.

Safety Considerations

Safety is stressed in the planning and development of this program and reviewed at training sessions prior to the start of the project. Several areas of concern are discussed with both the contractor and DER personnel. Briefly, the following is a summary of our precautionary measures.

Air operations safety is stressed to all people involved. The plan is submitted for approval to the Bureau Safety Officer and the Air Operations Specialist. Spot checks are made during the operation by these two individuals. The two-way radio system is also a very important tool used to improve safety.

Standard precautions for pesticide handling are followed by all personnel involved with the program. All of the practices used in the handling and transporting of the insecticides are evaluated to minimize the chances of contamination and spillage. Trucks, tanks, hoses, pumps, and spray systems are inspected before the insecticide is introduced. Filters of definite size are required at several places in the system and are checked frequently. Samples are taken for future analysis if a problem develops. Most of the insecticide transporting and handling is done by contract personnel. All DER personnel working at the loading site will have hard hats with chin straps and goggles. A first aid kit and eye wash bottle will be available at each operation site. Fire extinguishers are provided by both the contractor and DER.

A procedure to be followed in the event of an accident has been developed giving specifics on information needed and agencies to be contacted. This plan will be reviewed and revised, if needed, before copies are distributed to the field personnel.

Residents in all treatment areas are notified by letter and reminded to wash any residue from skin or clothing, or garden products that may be contacted by the insecticides. Notification of the scheduled treatment dates and program progress are made in local newspapers and on local radio news broadcasts. Campers and picnickers are notified in parks and campgrounds when they register. Park Rangers visit day use areas just prior to spraying to inform other visitors. Spraying is generally done during the early morning hours so human exposure is minimal.

In order to provide the desired protection, it is sometimes necessary to spray right to the shoreline of a lake to include water front homes, camps, and picnic areas. Care is taken in all cases to keep the amount of material contacting the surface of the water to a minimum. When recommended on the label, suggested by the manufacture, or requested by the property owner or manager, non-spray strips are maintained around lakes, rivers, or other sensitive areas.

Benefit/Cost Analysis

In 1984, the total cost of the program averaged out to \$11.85 per acre. This includes the cost of application, the purchase of the insecticide and the operational costs incurred by the state and participating county governments. The expenses of conducting this program are shared by the state and county with a percentage after-the-fact reimbursement from the federal government. The counties are called upon to provide 25-50% of the contract costs depending on the quantity of available state funds. The average cost per acre of treatment changes each year because of increases in application costs, differences in insecticide prices, amount of acreage treated with

different formulations and the total size of the program. For example, the total cost for Dimilin was \$10.00 per acre while Bt at 12 BIU's was \$13.60 and Bt at 20 BIU's was \$16.03 per acre. In 1983 the amount of Dimilin treated acreage was a small percentage of the total program and the total cost was \$13.40 per acre. In 1982 the total cost averaged \$12.48 per acre. While many costs vary greatly from year to year, some of the operating costs are more consistent and don't change in direct proportion to the program size. These cost figures can be used as reasonable current costs per acre in determining the benefit/cost ratio.

To determine the benefits, a number of items must be taken into consideration including: 1) the amount that a landowner is willing to spend to provide some degree of protection for his property; 2) the decrease in property value 3) the value associated with being able to enjoy a camping or picnic experience; 4) values associated with being able to enjoy one's backyard, i.e., not being bothered by caterpillars; 5) the value of preventing concrete sidewalks and patios as well as house siding from being stained by frass and decomposing caterpillars; 6) the benefits to the economy of the surrounding area; 7) value of treatment to the tourist, particularly resorts. All of the high-use, high-value areas that qualify for treatment can easily show a favorable benefit-cost ratio of 2:1 to 40:1 for short-term objectives depending on the amount of items considered in the analysis. Many benefit-cost items have been addressed in several USDA, Forest Service Research Papers (McCay and White, 1973, Payne, 1973, and Moeller, 1977).

The losses on State Forest Land are based on the value of the timber for both pulpwood and sawtimber. In 1984 the Bureau of Forestry conducted an appraisal to assess the mortality occurring in the past two years on 691,000 acres of affected stands in eastern and southcentral portions of the Commonwealth. The results of this survey show tree mortality rates of 28% for pulpwood and 33% for sawtimber over 350,000 acres, and 51% mortality for both pulpwood and sawtimber over another 341,000 acres. This is in comparison to an overall tree mortality average in defoliated stands of 21% reported by the Bureau of Forestry in 1980 through 1982. The total volume losses since 1982 were computed to be 218 million cubic feet of pulpwood and 951 million board feet of sawtimber. The combined value of the dead wood, based on current stumpage prices, was 104 million dollars or approximately \$151 per acre.⁴ In the past year salvage sales have been initiated on over 14,050 acres of State Forest Land.

Approximately 56% of the 1985 spray program will be high-value timber stands on State Forest Lands. The goal is to reduce the amount of tree mortality that has occurred in untreated stands. The benefits are clear with the average cost of treatment per acre projected to be \$10 per acre. The benefit/cost ratio on forest lands in the Commonwealth is at least 15:1.

⁴"Tree Mortality in Pennsylvania Forests Defoliated by Gypsy Moth - A 1984 Update," January, 1985. Unpublished in-house report of Pennsylvania Bureau of Forestry, Division of Forest Pest Management.

Scoping Activities

In Pennsylvania the majority of citizen contact happens at the county and township level. Each participating county must appoint a person to coordinate the program in that county. These coordinators are encouraged to report to the state any concerns and issues that are presented to them. Also the District Forestry Offices across the state are serving the public and responding to questions about the gypsy moth suppression program. When a county coordinator feels it is appropriate to hold a public meeting about the spray program, he is encouraged to do so and DER personnel are available to attend and actively participate.

In August of 1984, a series of meetings were held across the state with special invitations sent to the county coordinators and the District Forestry Offices. Part of this meeting was designed to give everyone the opportunity to voice concerns of the people they represented. The overall response was support for the DER program and generally favorable support of the change to biological spray material. Each county was asked to tell how the insecticide change had affected the comments and objector rate from the property owners in the treatment areas. The one issue that still remains a concern is that a continued educational effort be made to tell the people what they can expect from the spraying and what they can do if spraying is not conducted. DER conducted a series of public meetings across the state concerning Pennsylvania State Forest Resource Plan. Several comments concerning the gypsy moth situation were received and are documented in writing from each meeting.

Concerns and issues identified at the county level and the State's position are summarized as follows:

1. Spraying of private woodlots should be done in the State program.
Position - This possibility is being investigated at the State level, but no change can be made for 1985. Of primary concern is the additional funding required for an expansion of the program.
2. Stronger pesticides should be used in the spraying program on forested residential properties. Position - The Governor's position is that biological spray materials (Bt) shall be the primary insecticide for use in residential areas to minimize potential adverse health effects. The use of Bt significantly reduces the number of spray objectors which contributes to overall program efficiency. The use of Bt does meet program objectives in residential areas.
3. Use biological sprays instead of chemical sprays in residential areas.
Position - see number 2 above.
4. Spraying should be done along major hiking trails. Position - It is difficult to compile an adequate benefit/cost ratio for treating hiking trails. Many people believe hiking trails should be left in their natural state, regardless of insect problems. Also, an expansion of the program would require additional funding.

5. Property owners should not be charged for spraying. Position - The State requires counties to fund 25% of spraying costs. We recommend counties fund this amount from the county budget. Some counties refuse to do so and assess the individual property owner. This question must be settled at the local levels.
6. Continue with public education of the entire gypsy moth problem and its resolution. Position - The State currently conducts a widespread and varied educational program, as evidenced by public meetings. The State is looking at new ways and seeking to develop new ideas on reaching the public. Extensive amounts of informational material are currently available, speakers at public functions are available, and timely news releases are made.

Each year the suppression program plans are circulated to several state agencies and interested groups. They are encouraged to respond with any comments or concerns they may have. Public involvement in the scoping activities are implemented at the county level in Pennsylvania. Specific information regarding various issues and concerns identified, meeting attendance and other relevant information would require contacting each individual county coordinator.

The counties are notified of the areas that are approved or rejected in January by tabular lists and maps. All property owners within the spray blocks are advised by letter of the estimated spray dates, the materials being used, precautions to observe and who to contact if they have any additional questions. News articles are carried in the newspapers, on radio and television. Usually maps of treatment areas are made available for public inspection somewhere in each county and in the District Forester's Office.

There is support from within state agencies and interested service groups and forest product industries to continue and increase the efforts to make the public and the private woodland owner aware of the gypsy moth situation and how to get their questions answered.

AFFECTED ENVIRONMENT

Host Vegetation

Approximately 58% of the land area in Pennsylvania is forested.⁵ There are nearly ten million acres of forest land in the state that are highly susceptible to gypsy moth damage. These areas contain oak species as a significant part of the stand composition. The majority of the project

⁵Forest Statistics for Pennsylvania - 1978, USDA Forest Service Resource Bulletin NE-65, Table 1, page 6.

area is in the favored oak-hickory, oak-pine, oak-gum and red maple-elm forest types. In addition to this, there are now areas in northern hardwood which contain no oaks that are heavily infested. In these northern hardwood areas found mainly in the Appalachian Plateau Province, the gypsy moth are closely associated with the aspen and cherry species.

Potential Treatment Sites (Human Population Distribution)

All the treatment areas on private land contain permanent or seasonal housing. The human population density ranges from one family unit or seasonal dwelling per 25 acres to highly developed forest communities with residential areas having 25-40 family units per 25 acres. Occasionally a treatment area may include a complex of apartment buildings in a wooded area in which the human population density is even higher. By using the number of notification letters mailed out to property owners as a guide and using four as the average family size the population density in the residential treatment areas averages one or two people per acre. The range is from one person per six acres to six people per acre. The average population density in the forested residential areas being treated is three people per acre.

The treatment areas on state and county-owned land have few if any permanent residences on site. The population density during the peak cabin-use period is estimated at one person per 200 acres in these treatment areas. These areas would include day use areas, picnic areas and seasonal campgrounds as found in our State Parks. The State Forest Land treatment areas include day use areas, leased cabin sites, high-value timber lands, historically important natural areas and experimental forest management areas.

Nontarget Organisms

In the residential treatment areas the most common nontarget animals would include household pets, many species of birds, small mammals such as mice and squirrels and agricultural livestock. Other nontarget organisms that are readily found in gypsy moth susceptible areas are insects including aquatic insects, pollinators, gypsy moth parasites and soil organisms. In addition the treatment areas contain a wide range of plant species.

A major insecticide selection criteria is its effect on nontarget organisms. Generally, most plant species are being benefited by the spraying especially if they are acceptable gypsy moth diet. Normally plant species are not adversely effected unless there is an accidental contamination of the formulation or a highly improper application or spill. Most mammals would require quantities many times higher than they can obtain in a treatment area to cause an adverse reaction. The few nontarget insects that are susceptible to the spraying experience only a temporary reduction in their numbers for a short time following spraying. The specifics are different for each insecticide formulation, but with the materials selected for this program, the adversely effected species are limited mainly to leaf eating caterpillars.

Aquatic organisms that may be affected by Dimilin applications include water fleas, cyclops and immature copepods, mayflies, corixids and notonectids. If these species are affected, recovery occurs within 14 to 28 days (FEIS as Supplemented, 1985, page 62-63).

DER is a supporting agency of the cooperative program called the Pennsylvania Natural Diversity Inventory (PNDI). The purpose of the program is to classify, identify and inventory Pennsylvania's most vulnerable plants, animals, and natural communities. With the help of PNDI known locations of threatened and endangered species on the federal list are checked for proximity to treatment areas. No known threatened or endangered species locations have been found in a scheduled treatment area.

Geography

Pennsylvania can be divided physiographically into four sections or provinces; the Coastal Plain, the Piedmont Province, the Ridge and Valley Province and the Appalachian Plateau Province. The area of general gypsy moth infestation has increased to include all of the first three provinces and approximately the eastern 1/2 of the Appalachian Province. (See map Figure 3.) Several volumes can be found in any good library which expound upon the specific physical characteristics of these provinces. As a general summary the proposed project area ranges in elevation from 50 feet to 2,200 feet above sea level; contains gently rolling lowlands and coastal piedmont, great wide valleys, moderate valleys walled by long continuous ridges and a high plateau cut into irregular narrow valleys with steep slopes. Nearly all of the project area is in the Delaware and Susquehanna River Drainage Basins.

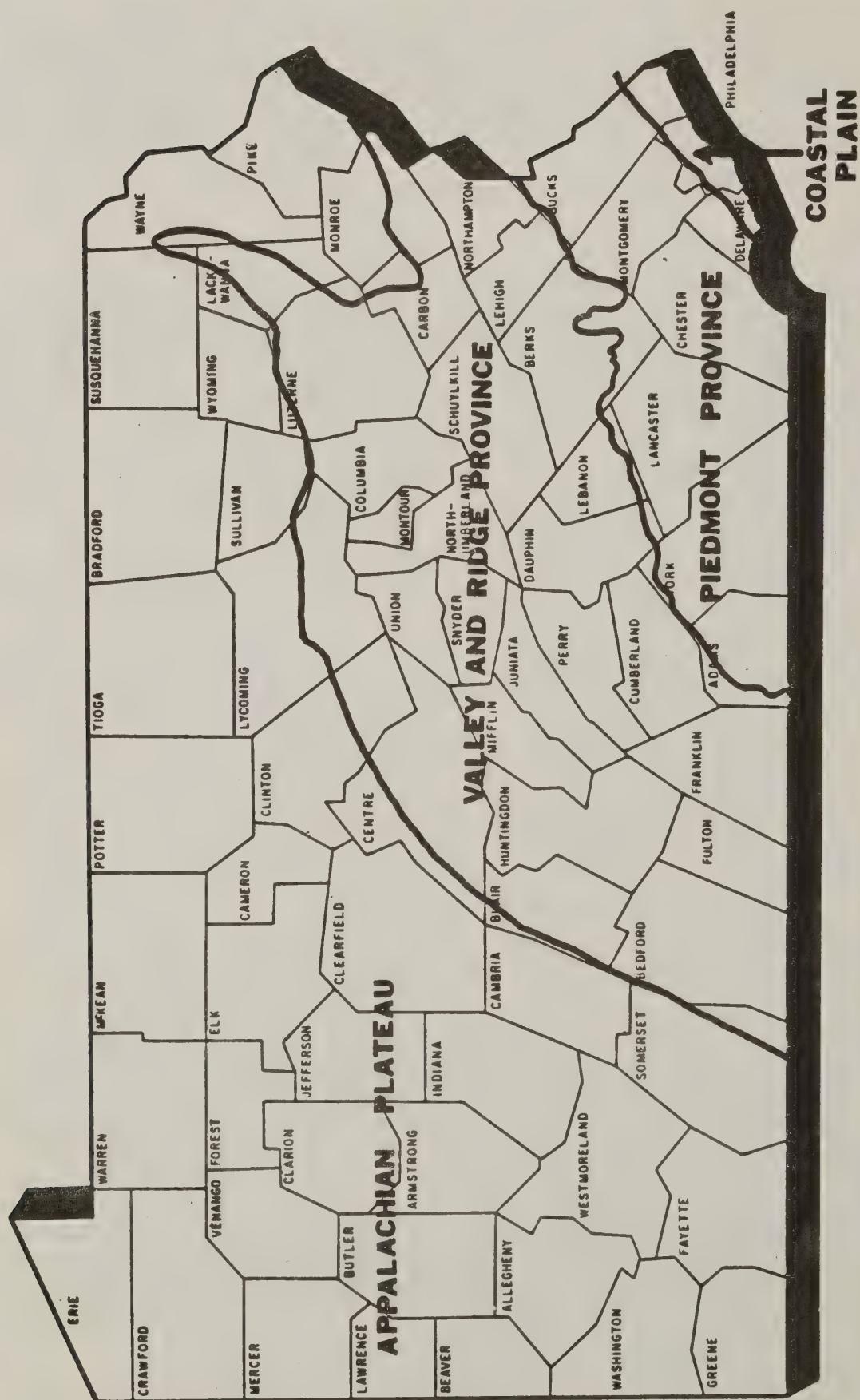
Agriculture is the predominant land use in the Piedmont and in the wide valleys of the Ridge and Valley Province. These same areas contain the larger cities, with the exception of Pittsburgh, and the highest concentration of people. These areas contain many small woodlots and low forested ridges filled with expensive homes. The amount of woodland greatly increases in the Ridge and Valley Province with long forested ridges which comprise the northern section of the Appalachian Mountains.

ENVIRONMENTAL CONSEQUENCES

Beneficial Effects - A properly conducted treatment will accomplish the objectives of foliage protection and gypsy moth population reduction. Meeting these objectives will produce a large number of beneficial effects. By protecting the foliage there is less stress on the trees and a dramatic reduction in tree mortality during the following two years. Foliage kept on the trees provides shade for humans, animals and other species of plant life. Nearly all animal life is forced to temporarily leave an area that is heavily defoliated. Preventing stress to the trees from defoliation improves the chances of a good mast crop and normal annual growth.

Beneficial effects of treatment also include the maintenance of stream shade for proper stream temperatures; maintenance of water quality by preventing water pollution from larval excrement and from soil erosion; maintenance of normal amounts of radial growth of forest trees. The prevention of enormous timber losses, as described in the Benefit/Cost Analysis Section, is a major consideration in conducting this program.

Figure 3. Physical Divisions of Pennsylvania



Killing large numbers of caterpillars will reduce the nuisance caused by invasions of numerous larva and the mess made by their droppings. Organized group camps will be able to conduct their normal activities without the constant interference from caterpillars and their droppings. It is estimated that nearly half a million residents (mostly small landowners) and over 100,000 visitors to forest high-use areas will benefit from the implementation of this project.

Adverse Effects - There are very few adverse effects from this treatment. The only ones worth mentioning are, themselves, rather minor in nature. The noise from low level aircraft which start operations at dawn can be expected to disturb the sleep of many people. Fine droplets of spray material are deposited on all exposed outdoor surfaces. Homeowners may wish to wash this material from some areas especially automobiles and uncovered lawn furniture. People are both curious and interested in the operation and make extra effort to view the aircraft. This is generally not dangerous unless they are also operating a motor vehicle. Spray droplets that fall on a vehicle windshield can be easily cleaned off, but initial movement of the wipers will cause the droplets to smear over the glass surface causing a drastic reduction in clear visibility.

This proposed project is not expected to adversely effect any threatened or endangered species or their habitat. Several times the program has included the treatment of a Registered Natural Landmark to prevent permanent adverse effects from severe defoliation. In every case there has been no adverse effects from the treatment reported. Specific environmental effects of the various insecticides registered for use against the gypsy moth have been thoroughly discussed in the USDA, Final Environmental Impact Statement. Reference is made there to the fact that both of the insecticides planned for use have low toxicity to bees and very little or only a temporary effect on nontarget insect populations including some of the parasites and predators of the gypsy moth. Mention of possible adverse effects of using Dimilin on nontarget aquatic insects was previously mentioned, and the reader is referred to pages 62-64 of the Final EIS 1985 for a further discussion.

In Pennsylvania's 1985 program, there are no site specific hazards from the proposed use of either Bt or Dimilin in any of the scheduled spray blocks.

Irreversible or Irretrievable Commitment of Resources

Some resources must be committed to the operation of a suppression project. The primary irretrievable resources are the human resources of manpower and dollars. Some of these dollars are spent to purchase other resources such as gasoline, oil, electricity, insecticides, and field supplies. All of these resources would be available for alternative enterprises if they were not used on this project. The public and the people controlling the allocation of these resources must consider this project to be worth the price. Another resource that is irreversibly affected are the trees that die due to the added stress of defoliation. These trees can not be brought back to life; they will not sprout because the roots have also died. The wood is not completely lost if salvaged within a few years and other trees will grow to take its place, but replacement requires many years.

Human Health

In the Pennsylvania program all residential areas, both rural and urban will be treated with a biological insecticide containing the bacterium Bacillus thuringiensis (Bt) in the formulation commonly known as Dipel®. The bacterium Bt is not a foreign organism, but occurs naturally in the environment.

Extensive toxicology testing of Dipel has been done using a wide variety of mammals, birds and fish and have demonstrated no toxicity at recommended field rates. One of these tests conducted on hamsters involved inoculation of the material onto the surface of the eye.⁶ Even animals with artificially induced corneal inflammation did not produce an infection. While these tests are not direct evidence of human safety they do provide solid evidence for comparison with other materials.

Some direct evidence of human safety does exist. A physician reviewed the medical records of workers involved in the manufacturing process of Bt whose cumulative level of exposure to Bt far exceeded that expected by an applicator or people in a treatment area. The physician could not find any medical symptoms to suggest that Bt was hazardous to their health.⁷ In Pennsylvania a total of 372,483 acres of private residential land containing thousands of people were sprayed with Bt in 1983 and 1984. Literature about Bt was distributed to every property owner in the treatment areas and no reports of human illness attributed to Bt have been received. While no systematic health survey was conducted the absence of any reports from a well-informed public is significant evidence of its human safety.

The reports of any adverse effects from any formulation of Bt are rather scarce. In Pennsylvania we have had a few cases of minor irritation by Bt from workers engaged in the insecticide mixing, and handling during the spray operation. Two reported cases of material splashed into a workers eye were treated with an eye wash of clean water and had no further irritation. Two other workers developed some skin inflammation after being exposed to another formulation of Bt (not Dipel) for several hours on clothing that was in direct skin contact. The workers received treatment from a local physician and the symptoms rapidly disappeared. The physicians diagnosis was that the workers were sensitive to something in the formulation and could not relate the symptoms to the bacterium. No adverse effects have been reported in Pennsylvania from worker exposure to Dipel.

⁶Laurentian Forest Research Center & Clinique Ophthalmologique Saint-Georges both Quebec Canada. Unpublished data, 1983.

⁷Abbott Laboratories unpublished data Feb. 1980 and Nov. 1984 from written communication Jan. 1985 from Kerstin B. Menander, M.D., Ph.D. Medical Director, Clinical Development Abbott Laboratories.

From Oregon there is the report of a worker who had a large amount of Bt splashed into his right eye and eventually developed a corneal ulcer due primarily to the problem being compounded by a steroid treatment and an already irritated cornea. The patient improved rapidly with no permanent damage after treatment with antibiotics.⁸

The potential for general public exposure to Bt is reduced by the fact that most of the treatment is done in the early morning hours when most of the people are indoors. There are many rural and urban residents in spray areas who have backyard vegetable gardens. Bt is registered for use on a wide variety of vegetable crops and will not be harmful to the vegetable plants. The residents are advised to rinse leafy greens that are harvested for eating after the spraying.

In this program the application of diflubenzuron will be at the rate of 0.03 lbs. active ingredient in one gallon of water per acre. As per label restrictions, all the diflubenzuron will be applied to sparsely inhabited forested areas with no more than one house per ten acres. The calculations for possible human exposure to diflubenzuron found in the FEIS Appendix F, Table 10, are based on using 0.06 lbs. a.i. per acre. Thus the realistic exposure levels in the Pennsylvania program are going to be one half the values found in Appendix F. This rate reduces the human risk factor and has shown to provide adequate foliage protection to meet our objectives.

ADMINISTRATIVE REQUIREMENTS AND CONSTRAINTS

Guidelines for Local Participation

DER will not include in a treatment project any of the qualifying areas, state- and federal-owned lands excepted, unless they are proposed by the county government. The scope of these problems is such that DER cannot make the initial selection of treatment areas on private lands. Also, matters of this nature are best performed at the local level. Resident spraying requests received by DER will be forwarded to the county for consideration.

The county government must perform the following steps in order to adequately fulfill their responsibilities:

1. Designate a county official to handle the local workload and to coordinate activities with DER. Duties include fieldwork in order to adequately prepare spray proposals and to have first-hand knowledge of problem areas. This county official shall be known as the "County Gypsy Moth Coordinator."
2. Initiate the project by submitting a request for control assistance by October 1 if action is desired in the following year. This deadline is extremely important due to federal requirements, field evaluations that DER must undertake in the county-proposed areas, and other contract deadlines.

⁸Dr. J. R. Samples written communication, Oct. 1984

3. The county request must contain information and a sketch of each treatment area, drawn on U.S.G.S. 7 1/2' Quadrangle maps. Allow 25 acres per dwelling, if the property is isolated and all forested. The Department will furnish spray proposal forms which are to be completed for each proposed area. The information requested on this form requires assigning a number to each area, and provide the township, acreage, type of area, egg mass density, housing density, brief location description, general attitude of the people toward a control project, and other information which may help the Department in its evaluation. This information is also necessitated by federal requirements and is included in the U. S. Department of Agriculture' Environmental Impact Statement.

The primary responsibility for organizing an effective spraying program rests with the county government. It is strongly recommended that the county enlist the aid and support of township and municipal officials to meet these requirements. An effective proposal must be based on considerable fieldwork to locate and evaluate those areas in need of treatment. This process should begin in July, after egg masses have been laid for the next generation. The period from July 1 to October 1 is the most critical time in the entire planning process, as far as county participation in this program.

Public Involvement

In Pennsylvania the public is very closely involved in the suppression project. In fact, without public involvement there would be no state conducted suppression program on private forest land. It is only when private citizens are concerned and express their feelings to the county officials that the county decides to participate and submit a proposal for treatment.

Information about the program is disseminated by county officials and state news releases are made available to newspapers, radio, and television. The information from the two governmental levels should complement each other by providing the state-wide picture and the local detailed situation.

State Responsibilities - Basically the state is in a position of assisting the county in its public relations and educational efforts. The state provides personnel who are willing to present illustrated talks and participate in discussions at public meetings and to interested groups. DER produces and distributes printed handout materials that can be used at meetings and displays at county fairs or other social functions.

Local Responsibilities - The counties are given rather wide latitude in the amount of public involvement that they wish to engage in. They are encouraged to use the local news media to inform people of the insect situation and the available suppression program. They are asked to send the state copies of pertinent correspondence, newspaper accounts, public meeting results, and similar information showing efforts to inform the public of the situation.

It is recommended that at least one public meeting be conducted in a convenient location near the majority of the insect problem areas, as both an informational session and to obtain an indication of the public sentiment toward a proposed project. The suggested time to hold such meetings is in the summer. Public meetings should involve, if possible, at least one of the county commissioners and other decision-makers at the county and state level. Concerned citizens should be invited to present their opinions on whether the county should or should not participate in this program.

Public Notification

The prime concern is to make people that are in designated treatment areas aware in advance of what, when and where the program involves. Every property owner is given the opportunity to have his/her area excluded from the treatment. This notification is in the form of a letter sent to each property owner in the treatment area by first class mail or personal service.

State Responsibilities - The state is responsible for preparing drafts of spray notification letters and fact sheets for use by the county. The state is also responsible for taking whatever steps are necessary to omit from spraying the properties of any owner who does not want spraying done.

Local Responsibilities - Property owners in treatment areas must be notified of the proposed project by the county. The Department's legal requirements specify that the county certify that proper notifications have been accomplished before any treatments will be made. The notification procedure begins in January when DER informs the county of the accepted proposals, and contains the following steps:

1. The county shall compile a mailing list of all property owners within the DER-approved spray areas. To avoid public confusion, care should be given not to include property owners outside of spray block boundaries. A copy of this mailing list shall be sent to the Forest District Office covering the county area.
2. Each individual on this list should be notified no later than March 15 by either first class mail or personal service. A reasonable attempt must be made to contact all property owners, which is defined as making at least two efforts either by mail, telephone, or personal service.
3. The county notification should be in the form of a letter and fact sheet, which shall be drafted by DER. The county may add anything to the drafted letter that it deems appropriate. To avoid confusion, it is strongly suggested that the county include a statement in this notice that there either is, or is not, a landowner assessment involved. Many previous objections to spraying resulted from landowner belief that he/she would have to pay for it.
4. A written statement of consent to spray, received by the county from a property owner, shall obviate the necessity of notification. Such written consent, however, should be acknowledged with a statement of when the spraying is to occur and the fact sheet on the program.

5. Property owners objecting to the spraying who notify the county in writing within 10 days of notification will have their property deleted from the project. Verbal or phone objections should be followed by a written signed notice. The county is responsible for accurately locating the objector's property. The county must promptly notify DER if it becomes necessary to delete all or part of a treatment area.
6. As soon as possible after areas to be deleted from the program are determined, each property owner affected by deletions, including the objector, should be notified that they are no longer included in the suppression program and may want to do some form of private treatment.

The county shall publish in area newspapers information concerning the proposed spray program including a brief description of the treatment areas. This should be done in March.

Precautionary Measures and Constraints

In order to consistently provide a quality service that accomplishes the objectives of the program without causing harm to nontarget areas or jeopardizing the safety of anyone working on the program or present in the treatment areas, it is necessary to have and follow a set precautionary standards and operational parameters.

Application Constraints--All application equipment is carefully checked by DER personnel including the Aviation Specialist and the Safety Officer. The equipment must be set

Carrying capacity--70 gallons to 400 gallons.
Air speed during application--60 to 90 mph.
Swath width--100 to 200 feet.
Application altitude--50 to 100 feet above tree canopy.
Nozzle type and size--flat fan, 8003 or 8004.
Boom pressure--35 to 50 psi.

There are several constraints concerning the conditions which must be met when the insecticide is applied. Briefly they are concerned with the following conditions:

1. Wind speed must be less than 7 mph.
2. Inversion conditions are not present.
3. Thermals are not preventing small droplet settlement. This generally does not occur until temperatures exceed 83°F.
4. The foliage is not in a dripping wet condition.
5. No rain is expected for a 4-6 hour period following application.
6. Spraying is confined to daylight hours beginning at dawn when other conditions are acceptable.

All treatment areas are laid out on 7 1/2 minute USGS topographic quadrangles. These maps show forest cover, elevation contours and bodies of water along with man-made structures such as roads, buildings and powerlines. Occassionally aerial photos in black and white are available for the pilot to study. Any pilot who is unfamiliar with the area is taken on a reconnaissance flight or flies the area himself with a DER representative acting as navigator. The treatment blocks are laid out to take advantage of as many natural landmarks as possible. Additional marking is provided by the placement of helium filled balloons along the boundary lines. Areas inside a spray boundary or directly adjacent to it that are to be excluded are marked, where necessary, with balloons of a different color. Pilots are given the maps to examine at least one day before the spraying and are briefed at that time and again before the actual departure to spray the area.

Radio communications are maintained between the loading site and marking crews by use of mobile and portable FM two-way radios aided by a network of mountain top automatic relays. The applicator is required to have radio contact with the loading site and the marking crews.

Environmental Constraints--All bodies of open water that are in a treatment area are to be excluded by the pilot. Sometimes it is necessary to treat up to the shoreline in order to protect the desired resources. Label restrictions and federal agency regulations dictate the amount of precautions that are used with different materials. The Pennsylvania Fish Commission and the Bureau of Water Quality in DER are kept informed of our program plans and provide suggestions, requests for changes and monitoring where deemed necessary.

A local government has never asked for more stringent constraints than those already imposed by the State. The State officials would be willing to listen to their request and implement tighter constraints if it did not jeopardize the integrity of the program and was justified.

When a chemical insecticide is being used a property owner or land manager may request a no-spray buffer zone of up to 500 feet be placed around a special sensitive no-spray area. This zone is included in the exclusion area marked by special balloons and indicated on the pilots map. This zone is used to absorb any horizontal drift from the edge of the spray swath.

Human Health--Several precautions are used in the program to minimize exposure of the people working on the program and those in the treatment areas. As much as possible densely populated areas are sprayed in the morning before children leave for school. Information is provided in the notification letter to minimize exposure by not running outdoors and looking up when the ship passes over. This is primarily to reduce the chance of getting spray droplets in the eyes. The notification letter also contains the phone numbers of local contacts if more information is needed or to report any incident connected with the operation. The State Police are advised in advance of our operation. Anyone who does not get a notification letter can contact their local county gypsy moth coordinator, or their district DER, Bureau of Forestry Office.

Probably the most important thing to minimize exposure in the treatment areas is to insure that the material is constantly being applied at the proper rate and in the proper droplet size.

At the loading site standard pesticide mixing and handling precautions are followed according to the toxicity of the material being used. Loading is done with hose lines equipped with shut off valves to reduce spillage.

Performance Monitoring

Monitoring is actually a continual process in the development and execution of this operation. The development of the target insect must be monitored as well as the quality of the application and the effectiveness of the insecticide. All of these things are important to the outcome of the program and should have the appropriate amount of time and attention given to them.

Application Monitoring--The contractor never works on the program without State personnel acting as advisors, timekeepers, overseers and block markers. Weather conditions are checked at local flight services and by local weather forecasts. The decision of whether conditions are acceptable for application are made by foresters working for the State. The contractor can decline to fly if some condition with the equipment, visibility, hazards or his personal physical condition dictates that he shouldn't fly. The contractor cannot change the decision and fly when the forester says conditions are not acceptable. DER personnel also monitor the mixing and loading as well as contract compliance. The pilot is responsible for the quantity of material in each load and should not attempt to exceed the capacity of the equipment.

The primary means of application monitoring is with the use of spray deposit cards. These are placed in treatment areas, in buffer zones and in exclusion areas to monitor droplet size, distribution, drift and treatment outside the designated area. This type of program does not lend itself well to the use of chase planes and the cost is not justified by the amount of times they are needed. Ships are equipped with cumulative spray time clocks to provide an additional check on maintaining a constant application rate.

Environmental Monitoring--All field personnel working on the project are advised to be observant for signs of any adverse environmental effects. Residents from the treatment areas are usually quick to call the proper county or State officials if they become aware of any damage or unpleasant situations.

Whenever appropriate, egg masses are collected in January or February and hatched in the laboratory for egg viability analysis. In the field daily observations are made in April for initial hatch and then for progression of hatch in estimated percentage. At the same time observations are being made on foliage expansion and leaf development of important food species.

The ideal spray time is when hatch is complete and leaf development has progressed to 1/3 of full expansion. Systematic pre and post treatment larval population monitoring of all treatment areas is not possible with the manpower currently available. Causal observations are made when time permits in part of the treatment areas to see if larvae are being killed, but no attempt is made to gather statistically significant quantitative data. Considering the past years experience with this material, extensive quantitative monitoring is not viewed as being necessary.

Foresters working on the program or the monitoring teams will make an onsite inspection when a complaint is received. If additional work is required, samples are taken for future analysis and the product company representative is contacted. If the damages are substantiated and are a result of improper application, the application company representative is also contacted.

Monitoring of environmental constraints is nearly all a process of application monitoring using spray cards and looking for droplets on surfaces where they are readily visible. Other bureaus in DER and sister state agencies are contacted if the report of any environmental damage relating to the project needs intensive investigation.

After the entire spray program is completed, all the treatment areas are checked for foliage protection by aerial observation and some are photographed. Some of the areas are visited on the ground at peak defoliation to verify the aerial survey. A percentage of the treatment areas are visited in the fall for egg mass surveys. County gypsy moth coordinators are asked to report any observed abundant adult moth activity in a treatment area.

Federal and State agencies have conducted many studies relating to various environmental effects of our spray program. Any of these agencies are free to conduct new studies or repeat old ones if they so desire. At the present time DER feels that the important questions about the short-term effects of our chosen spray materials have been answered. The current monitoring needs concern the degree of target insect control achieved at various population levels and with various formulations of the biological sprays.

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
COOPERATIVE GYPSY MOTH SUPPRESSION PROJECT - 1985

INTRODUCTION

Gypsy Moth Status

A biological egg mass survey conducted in Rhode Island in the fall of 1984 showed that high levels of egg masses occurred on at least 102,500 acres located in fourteen cities and towns (Figure 1, Table 1). Earlier in the year, 164,600 acres of forest were found to be moderately to severely defoliated, making this the third greatest defoliation recorded in Rhode Island. Much of the defoliated area corresponds with areas now infested with at least 1,000 egg masses per acre.

There is a strong indication that the gypsy moth population is again building in the state. From the record defoliations of 1981 and 1982, where 226,895 acres and 368,480 acres respectively were defoliated, the defoliation dropped to 55,095 acres in 1983. An egg mass survey conducted in the autumn of 1983 showed only 21,370 acres to be infested with a density in excess of 1,000 egg masses per acre. All indications were that the population would continue to collapse; however, as the defoliation survey revealed, the population appears to be rebuilding.

Purpose and Need for Action

Direct suppression will be limited to high value or high use forests where defoliation may result in death of trees or impairment of their use or in reduction of their quality. Being highly unpredictable both as to extent and magnitude of an outbreak every year, neither the affected towns or the State can easily determine how much money needs to be appropriated in any given year for gypsy moth control. Further, the cities and towns and the state as well, do not utilize operating revenues for gypsy moth control. Special appropriations are needed as outbreaks occur. Federal assistance is needed to aid the communities as the appropriations needed for a suppression program are often beyond the means of the communities if they were to fund the entire program.

PROPOSED PROJECT

Project Statement

DEM proposes to carry out, in cooperation with the USDA Forest Service, an integrated pest management approach in meeting the impending problem. The major portion of heavily infested forest land will not be treated, thereby allowing natural factors to aid in stabilizing pest numbers. Direct suppression spraying is proposed for as many as 25,000 heavily infested acres in Providence County. Treatment will consist of a single aerial application of *Bacillus thuringiensis* (Bt) applied at the rate of 12 BTU per acre, with a

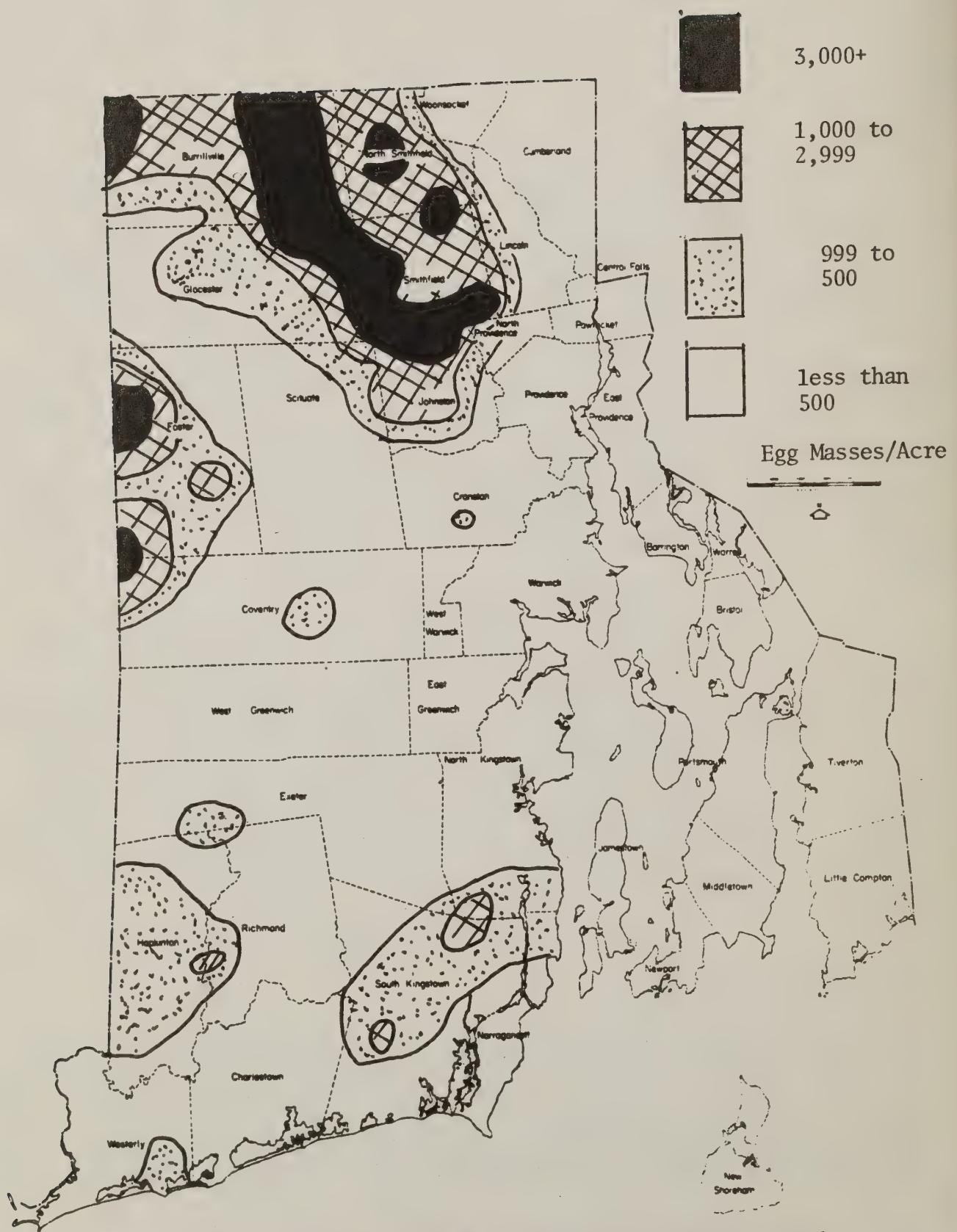


Figure 1. Egg Mass Densities in Rhode Island Autumn, 1984

Table 1. Acreages of Egg Mass Densities by Towns in Rhode Island + 1984

Town	Density in Egg Masses/Acre		
	500-999	1,000 - 2,999	3,000+
Burrillville	3,000	15,350	10,875
Charlestown	150		
Coventry	8,475	1,625	500
Cranston	1,225		
Exeter	4,975		
Foster	11,825	9,575	4,150
Glocester	15,350	5,550	5,000
Hopkinton	18,050	250	
Johnston	6,150	6,300	650
Lincoln	2,925	1,525	250
Narragansett	2,225		
North Kingstown	2,650	5,300	
North Providence	750	375	125
North Smithfield	2,575	8,025	3,250
Richmond	7,125	750	
Scituate	6,150	1,575	
Smithfield	250	7,100	9,775
South Kingstown	15,570	4,625	
Westerly	<u>6,300</u>		
TOTAL	115,900	67,925	34,575

total spray volume of 64 ounces per acre based on data supplied by the pesticide supplier.

Organization

Responsibility and policy making authority with regard to gypsy moth suppression in Rhode Island falls within the Department of Environmental Management. The said agency has broad authority in the areas of protecting the environment and natural resources of the state. Specific legislation, Chapter 17 (Sections 2-17-1 through 2-17-8) of the General Laws, authorizes and requires gypsy moth suppression.

The state agency policy in this connection is to serve the public by providing an effective and acceptable gypsy moth management program directed at reducing tree damage and loss in high-use, high-value areas, and reducing defoliation to tolerable levels. The program is not aimed at gypsy moth eradication.

The agency official having responsibility for the proposed project is:
Henry J. Deion, Chief, Division of Forest Environment
R. I. Department of Environmental Management

Objectives

Suppression action objectives are to reduce gypsy moth larval populations significantly and thereby preserve foliage for economic, recreational and esthetic values, prevent tree loss, and to successfully cope with the threatening defoliation in the areas to be treated. Suppression spraying will be considered successful if defoliation in the treated areas is held to less than 60 percent and if information received from interviews of a reasonable sample of owners of property located within the spray blocks indicates that, in the majority, those interviewed express satisfaction with the results.

Biological Monitoring

For the purpose of determining the starting date for spraying, the proposed suppression areas will be surveyed for completeness of egg hatch and degree of foliage development. Spraying will commence when 50% of the larvae has reached the third instar and/or oak leaves are greater than 25% expanded.

Defoliation evaluations, both pre and post-spray, will be made of all the suppression areas. The technique to be used will be that of making a subjective estimate of the defoliation of the entire stand within each spray block. The pre-spray evaluation will be made from the ground immediately prior to spray application, and the post-spray evaluation will be made from the ground at end of the larval stage.

Treatment Area

The selection of areas proposed for treatment is based upon the knowledge gleaned from an aerial defoliation survey and subsequent ground biological evaluation. It has been found through experience in Rhode Island that 1,000 egg masses per acre yield sufficient caterpillars to cause significant defoliation and to generate conditions which the public considers intolerable.

From the heavily infested areas of the state, treatment areas will be selected with the aim of attaining the objectives of the proposed suppression program. Treatment will be limited to forested residential areas with infestations of at least 1,000 egg masses per acre, to areas highly used by the public, including parks, campgrounds, picnic groves, and to economically important forest areas threatened by heavy infestations.

Final spray area defining will not be completed until after local authorities have been given the opportunity to participate in this function.

Location

The treatment area will fall within the hatched area in Figure 2.

Treatment Selection

Direct suppression spraying is proposed for as many as 25,000 acres in Providence County. For this project, a single application of the biological insecticide Bacillus thuriengensis (Bt) will be applied by helicopter or fixed wing aircraft at a rate of 12 BIU's per acre.

Bt meets the criterion of being registered for the use intended by the United State Environmental Protection Agency and the State of Rhode Island.

Treatment Type

All treatment will be by aerial application. No ground spraying will be done.

Selection Criteria

In addition to being registered for use against gypsy moth, the following factors were used to determine a pesticide for use:

- a. Safety: the pesticide must be safe with normal precautions to workers handling the material, the human population being sprayed, and have no adverse impact on other flora or fauna.
- b. Effectiveness: the pesticide must be effective in controlling gypsy moth as demonstrated by verifiable field tests.

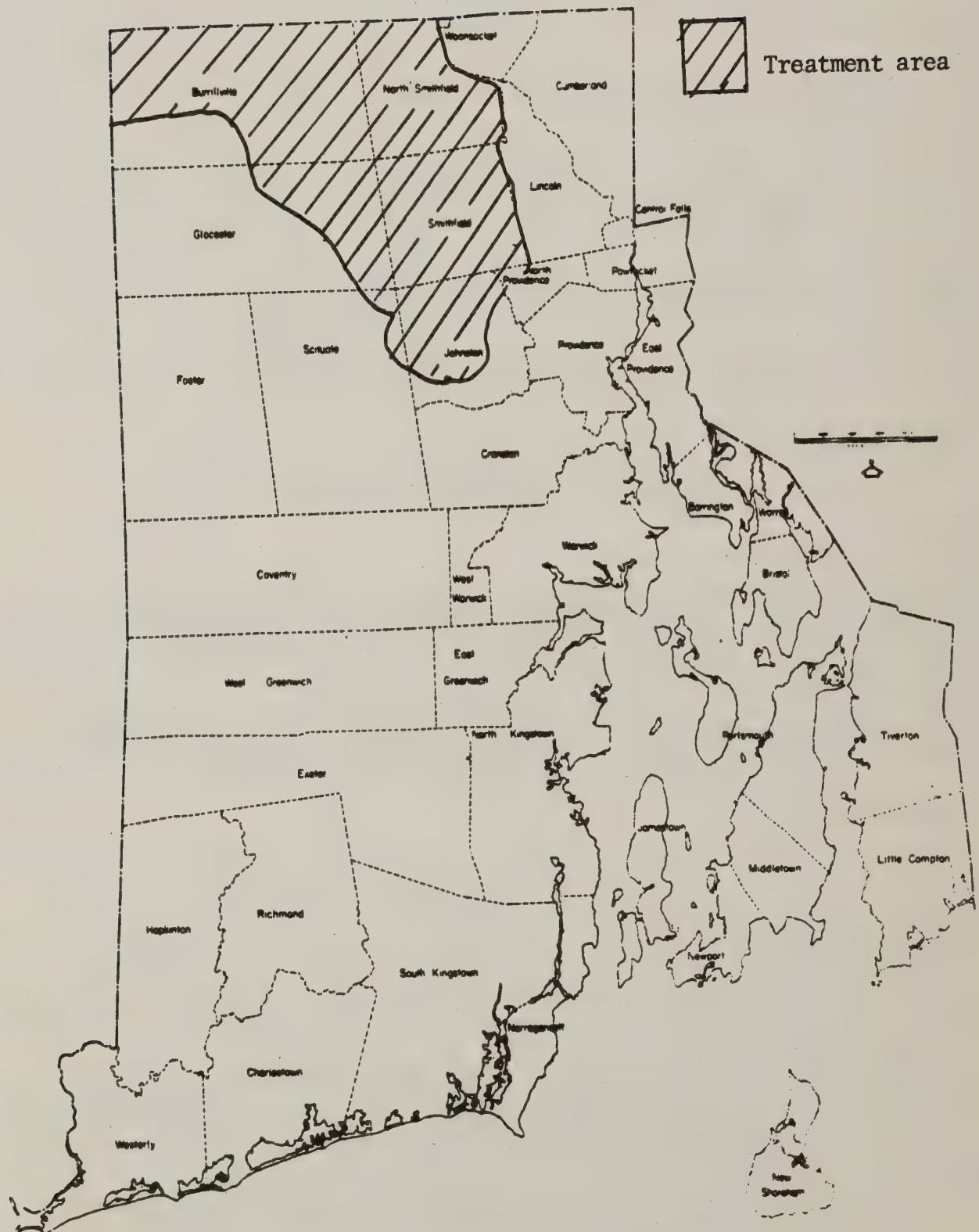


Figure 2. Treatment Area for Gypsy Moth in Rhode Island - 1985

c. Cost: the pesticide must be available in quantity at a price that, once all other criteria are satisfied, will not exceed the capacity of the affected communities to pay for the pesticide.

The factors are listed in descending order of importance.

Method of Treatment

DEM plans to conduct the aerial spray operation by contracted helicopters or fixed wing aircraft or both. Each aircraft's equipment will be inspected and calibrated by agency personnel to assure that the insecticide is dispensed at a proper rate.

The spray application will be timed to obtain maximum benefits. It is anticipated that this activity will begin at the time of complete egg hatch but before significant defoliation has taken place. This usually corresponds to a date starting May 15 and finishing by June 5.

Agency responsibilities include all aspects of planning, with cooperation of local officials, and directing the suppression project. Such activities include all final mapping and acreage determination of spray blocks, determining the starting date of the operation, and when to begin and end operations on any day the program is in progress and the investigation of any report of problems or incidents arising from the spray application.

Safety Considerations

Because the contract for spraying is to require that the vendor is to provide the spray material in its final formulation, ready for application, no mixing or other handling of insecticide will take place at aircraft loading sites. Safety equipment needs with respect to aircraft and their service vehicles are to be spelled out in the vendor's contract. All other safety functions, responsibilities and equipment requirements will be explained in considerable detail in the Project Safety Plan.

Benefit/Cost Analysis

There are 30,000 acres in the state that require suppression by spraying of the gypsy moth infestation according to the criteria. The cost of a suppression project on these acres is estimated to be \$510,000, or \$17.00 per acre for aerial application. One application of 64 ounces per acre of Bt (containing 12 BIUs of active ingredient) by aircraft is planned for 30,000 acres.

An important benefit to be derived from the suppression project to reduce gypsy moth populations, is to reduce defoliation in areas occupied by people. In Rhode Island, with a high human population, the woodlands receive high use for residential and recreational purposes. The values individuals place on these aspects would be protected by the application of Bt to reduce gypsy moth populations.

Another benefit would be to maintain the shade and ornamental tree values by preserving foliage and preventing tree mortality. The International Shade Tree Conference and the National Arborist Association estimate that the value of shade trees is nine dollars per square inch of cross section of trunk measured at 4½ feet above ground. Therefore, a 4-inch tree would be worth more than one hundred dollars.

Tree removal and replanting cost vary in Rhode Island, however, the figure generally exceeds two hundred dollars. Assuming that only one tree per acre dies as a result of defoliation, and that the treatment would cost \$17.00 per acre, the resulting benefit cost ratio would be 11.76:1. Past defoliations in Rhode Island have resulted in greater mortality so this estimate of benefit/cost is likely conservative.

Recreation values would be severely affected if the proposed project is not conducted. Both short-term and long-term impacts are involved with the most severe conditions being experienced in the short-term on developed recreation sites. Picnic areas, youth camps, summer homes and bridle paths would be closed during the height of the defoliation when caterpillars are in the fourth and fifth instars. If no action is taken to prevent the gypsy moth population from running its natural course of outbreak and decline, experience in other states shows that the short-term period would likely be three years. The long-term considerations would involve the removal of dead trees in high-use areas for the safety of people.

The proposed suppression project would satisfy the will of the people who have required by law that the Department of Environmental Management keep the gypsy moth under control.

Scoping Activities

Scoping activities began upon completion of the egg mass survey when it was evident that the 102,500 acres of heavy infestation was an increase of the 21,370 acres similarly infested in 1983.

Based on past public objection to the use of chemical insecticides, chemicals were not even considered as an alternative.

A meeting of representatives of the Divisions of Forest Environment, Fish & Wildlife and Parks & Recreation established the control measures to be taken on DEM administered state property. Consensus was only to treat high use recreation areas and prime or unique timber areas leaving the majority of state land untreated.

A meeting of representatives of all potentially infested communities as well as representatives of the Rhode Island Group Against Spraying Pesticides (RIGASP) and the Audubon Society of Rhode Island was held to address their concerns. The only environmental issue raised was the question of spraying the entire infestation to eradicate the gypsy moth. The concern was answered by explaining that block spraying would be cost prohibitive and it would not

eradicate the gypsy moth under the best possible conditions. The intent of the proposed program is control of this year's population. No attempt is being made to eradicate the pest.

Other issues raised dealt with the financing of the program, the use of military aircraft to conduct spraying, and potential long range plans of DEM.

Public hearings have been held in every community potentially involved in a control program and DEM officials were present to answer questions.

AFFECTED ENVIRONMENT

Host Vegetation

The majority, 46%, of the vegetation is composed of red, white, scarlet and other oak species (*Quercus spp.*). Another 35% of the vegetation is composed of coniferous species, primarily white pine, hemlock and cedars. The remaining 19% is composed of mixed hardwoods, primarily red maple, birch, hickory, ash and cherry.

Potential Treatment Sites

The treatment sites are rural/suburban communities with populations clustered in small villages. Rural homes exist along the highways and town roads. There are no large concentrated areas of population in the treatment area. The population density is as follows:

Average population density = .32 persons/acre
Average housing density = .13 units/acre
Highest population density = 7.60 persons/acre
Lowest population density = .10 persons/acre

The highest population density occurs on 500 acres, while the lowest density occurs on 33,170 acres.

Nontarget Organisms

Bt will affect most or all lepidopterous larvae present at the time of spraying. Most lepidopterous species are also defoliating as are gypsy moths. The Division of Fish & Wildlife, DEM, indicates only one species of interest, that being the buck moth (*Hemileuca maya*). This moth occurs only in Washington County outside the spray area and does enter the larval stage until mid-summer, well after the gypsy moth spraying is complete. Other insects (notably bees) and other flora and fauna are not affected. The only endangered species of possible concern are the bald eagle (*Haliaeetus leucocephalus*) and the peregrine falcon (*Falco peregrenis*), neither of which will be affected by the spraying as determined by biologists from the Division of Fish & Wildlife.

Geography

The entire treatment area lies within the upland hilly land of the New England province. The soils are largely upland till plains with some areas of glacial outwash located in every town. Glacial stones and boulders are commonly strewn on the surface of the treatment area. The area consists of gently sloping hills with an elevation of between 284 and 812 feet above mean sea level.

ENVIRONMENTAL CONSEQUENCES

Environmental Effects

Beneficial - The suppression project will yield several beneficial effects in maintaining and protecting the environment. Of primary benefit will be the protection and preservation of a major portion of tree foliage that would be destroyed by gypsy moth larvae if no spraying were conducted. The protected foliage will provide aesthetic value in recreation areas for camping, hiking and picnicking, which are of high value in Rhode Island. Tree foliage also provides shade and beauty for people from all walks of life for their personal enjoyment and well-being. The natural aspects of the communities and recreation areas to be treated, includes the presence of trees for residential settings, recreation and roadside beauty. Protection of foliage will reduce accelerated mortality of trees to allow for a moderate tree mortality rate and thus maintain the natural ecological balance and succession of treated woodlands.

Another major benefit to be realized by the proposed suppression project, is the reduction of defoliation caused by millions of caterpillars and by the damage they cause. In the summer, with many people enjoying the out-of-doors and keeping windows open, dust and traffic noise can spoil the environment. Tree foliage provides a buffer against high noise levels and dust. Protection of the foliage against high gypsy moth populations will be provided by the proposed spray project for the maintenance of this buffer.

The proposed spray project will help maintain a woodland environment in which the foliage of trees provides shelter and food for a wide variety of birds, mammals and insects. If the food and shelter are not protected, these animals will move to uninfested areas for their needs, thus compressing territories and causing ecological imbalance in these uninfested areas.

Adverse

The Final Environmental Impact Statement as Supplemented-1985, indicates that no human health uncertainty has been identified through the use of Bt. Should any beneficial lepidopterous species, as yet unknown, be in the area at the time of spraying, the majority of the woodlands will remain unsprayed. There should be no disruption of habitat even in this remote chance.

There are no known eagle or falcon nests in Rhode Island. Should a nest be discovered, the Division of Fish & Wildlife will be consulted to determine necessary precautions not to disrupt their life cycle.

Under the conditions of spraying, no long-term adverse effects from the proposed suppression project is expected.

There will be a temporary noise factor at the time of spraying. This will be dealt with as described in the administrative requirements and constraints.

Irreversible or Irretrievable Commitment of Resources

The proposed project to suppress gypsy moth population will have little to no undesirable effect if it is conducted. The biological spray to be used is effective against the gypsy moth while having no long-term adverse effect on the environment. No irreversible or irretrievable effects, or long-term undesirable impacts on the environment will be caused by the use of the insecticide in the amount and manner proposed. No plant or animal species would be eradicated.

Irretrievably committed to the project would be man hours, financial resources, insecticide and fuel, which if not expended on this project would be available for other uses.

Human Health

Based on information from the Final Environmental Impact Statement as Supplemented - 1985, there are no human health risks associated with the use of Bt.

Of possible concern would be a crash or forced landing of the spray aircraft. This will be addressed in the safety plan and contract requirements stipulating that aircraft be airworthy and properly maintained throughout the program. Flights over schools will be conducted prior to the start of the school day. Flights over public water supplies will not occur in this program.

ADMINISTRATIVE REQUIREMENTS AND CONSTRAINTS

Guidelines for Local Participation

Preliminary delineation of proposed spray areas will be mapped by DEM. Subsequent to finalization of the state suppression program, DEM will mail each heavily infested community a complete program description and map of proposed spray areas within the community. It will then be the community's responsibility to examine the benefits and risks of a biological spray program, to convene a public meeting for all of its interested residents to discuss the issue and to determine whether or not the community will participate in the state spraying program. Informational materials will be provided by

the Department to assist in this decision making. Every affected community must provide evidence of a vote and passage of a resolution regarding its decision on participation in the spraying program. If the decision is in favor of participation, the community must also provide the name of a person to serve as local coordinator with whom the department personnel can complete arrangements for the spraying program. Biological spraying will only be carried out at the request of a city or town, and after their consideration of associated risks and benefits. It should be noted that no community is required to participate in the spraying program. The department's personnel will work through the community contacts to revise proposed spray areas to meet community requirements. Any property may be deleted from the spraying program upon the request of the owner. Additions to the spraying program that meet the criteria for spray areas will be considered.

Public Involvement

Information about the program will be given by DFE personnel and the Office of Information & Education, DEM. A DEM official will be available at one public meeting in every community potentially involved to answer questions and concerns. DEM personnel will be continually available to the media for interviews and information. A close liaison between a designated DEM official and each community involved has been established to answer questions.

A pamphlet explaining the life cycle of the gypsy moth and home owners control methods is available for free distribution to all interested citizens.

State Responsibilities

DEM officials will be available to answer technical questions about the program and the effects of gypsy on the environment. DEM officials will also be available to communities to answer any questions not known to local officials.

Local Responsibilities

The local coordinators, named by all participating communities, will of necessity, be required to assume the major responsibility for public notification and education. The state agency will assist in this effort by maintaining a close liaison between each coordinator and DEM. Each coordinator will have one contact person at DEM who will be available to the coordinator as much as possible. Pamphlets designed for homeowners' use, describing the life history habits and control measures of gypsy moth, will be given to each community for free distribution.

Public Notification

The public will be notified three days in advance of the beginning of the anticipated starting date for control. The use of all media will be sought to reach the largest possible audience.

State Responsibilities

During the course of spraying, the public will be informed by DEM as to the daily progress and areas scheduled for spraying in the immediate days ahead. The Office of Information & Education will be staffed at all times during spraying and will contact broadcast media of progress and/or changes as soon as they occur. DEM officials at the spraying site will relay information to the I & E office via telephone.

Local Responsibilities

Local information will be disseminated by the local coordinator. The local coordinator will notify objectors by telephone when spraying is to be done in their area. Other persons needing precise information as to spray times will be notified through the local coordinator.

Precautionary Measures and Constraints

Application Constraints - Weather and time factor guidelines on when to start and terminate spraying on any given day of operations will be followed. Application is to be made under the following conditions:

1. Winds between 2 and 10 mph.
2. Temperatures less than 80 degrees F
3. Foliage dry and rain not expected 24 hours following application.
4. Inversion conditions not present.
5. Depending on above conditions, morning applications will be made from 5 to 10 a.m. and evening applications from 4 to 8 p.m.

Insecticide bulk containers, furnished by the vendor, shall be properly labeled as to content.

All spray blocks and sensitive areas not to be sprayed, will be delineated in contrasting colors on 7½ minute topographic maps. These maps will be explained and given to the aircraft pilots prior to each day's operation. Moreover, a color coded system, employing helium filled balloons to identify spray area boundaries and exclusions areas, will be followed.

All helispots will be designated restricted areas and appropriately identified as such with barriers and signs to ensure public safety.

All aspects of safety, precautions and personnel responsibilities in these areas, will be explained in detail in the Project Work Plan and Safety Plan.

Environmental Constraints

The insecticide product will be used in strict accord with all label directions and precautions with the aim of minimizing adverse effects while

attaining maximum pest control benefits.

Spray pilots will be carefully instructed not to spray, or cause spray to drift into bodies of open water.

A no-spray buffer zone will be added to area of any property which is not to be sprayed by owner request.

Human Health

As far as possible, densely populated areas will be sprayed in the early morning hours before school children leave their homes. School properties will be identified and sprayed in the early morning before school is in session.

Timely news releases, informing of when and where treatments are to take place, will serve to advise people to remain indoors when their neighborhood is being sprayed. Broadcast media will be used to insure continuous updating of information.

At the loading sites, standard handling precautions will be followed. Aircraft loading will be done with hoses equipped with shut-off valves to prevent spillage.

Performance Monitoring

Application Monitoring

The spray application will be monitored to prevent or detect any problem with proper coverage. Ground observation will be employed. Moreover, spray detection cards will be used to determine adequacy and accuracy of spray deposit.

Every helispot activity and all aspects of spray pilot instruction as to spray zone bounds and sensitive areas, will be under supervision of state agency personnel.

Environmental Monitoring

Surveys will be made to determine degree of leaf expansion and completeness of egg hatch to assure proper timing of start of spray program.

All observed and/or reported incidents or complaints relating to the spray program will be investigated by state agency personnel.

Observations will be made to determine the degree of pest suppression and foliage protection resulting from the spray application.

Other agencies of state government which have interest in health, water and wildlife areas will be invited to participate in any monitoring activities which they deem necessary.

WEST VIRGINIA DEPARTMENT OF AGRICULTURE
COOPERATIVE GYPSY MOTH SUPPRESSION PROJECT - 1985

INTRODUCTION

Gypsy Moth Status

The State of West Virginia has not experienced any defoliation by the Gypsy Moth to the present time. However, this is probably due to the abatement actions taken in 1979, 1983 and 1984. In 1979 an isolated infestation of the gypsy moth was found on the Blue Ridge in Jefferson County. Other areas of the state were not known to have any infestations. Two applications of Dimilin on the Blue Ridge in 1979 successfully eradicated or reduced populations to undetectable levels. In 1983, 16,735 acres were treated in Berkeley and Morgan Counties with B.t. to provide foliage protection and reduce population levels. The foliage protection was provided but population levels were only reduced by 43%. In 1984, 46,992 acres were treated in Jefferson, Berkeley and Morgan Counties. Approximately 8,000 acres were treated with B.t. (Dipel) and 38,992 acres were treated with Dimilin.

The current situation in West Virginia shows the gypsy moth to be in heavy concentrations (250 to 4,000 egg masses per acre) in Morgan, Hampshire and Mineral Counties. Morgan County is infested throughout with the exception of the area treated in 1984. The highest concentration of egg masses can be found on Cacapon Mountain, the valley between Cacapon Mountain and Sleepy Creek and Sideling Mountain. The northern parts of Hampshire and Mineral are infested with concentrations being found on Town Hill Mountain in Hampshire County and Knobley Mountain and Green Mountain in Mineral County. Larval stages of the Gypsy Moth have been found in Hardy, Grant and Preston Counties, but no major infestations exist at the present time. Larval stages have not been found in any other counties south and west of the currently infested Eastern Panhandle.

Male moth trapping during 1984 did not reveal any new infestations. The numbers caught state wide were low and no counties outside the infested counties had any other life stages.

Purpose and Need for Action

In the past, the gypsy moth problem in the northeast has been said to be cosmetic. It may well be cosmetic where forest stands have a small component of preferred species such as oak. In West Virginia the component of oak-hickory statewide is approximately 60%. In the Eastern Panhandle of West Virginia the forest stands are 80% oak and in some instances pure stands of white and chestnut oaks exist.

The major objective of the suppression project is foliage protection and secondly the reduction of gypsy moth populations. Parts of areas slated for treatment have already experienced moderate defoliation by loopers for two years and 30% of the oaks are dead. During 1984, tree mortality was still being noticed and in some areas 40% of the oaks were dead. The looper population has collapsed and now the gypsy moth is in the same areas. We would hope to achieve at least 80% foliage protection

to the trees and reduce gypsy moth populations by 80-90%. The trees in this area are under stress from the 1983 drought and looper complex. Protection of the foliage is essential if the trees are to survive. If left untreated we would expect to lose essentially all hickories and approximately another 30-40% of the oaks. The hickories had 47% mortality with the looper and another defoliation would certainly kill most of the remaining trees. Another 30-40% loss in oak stands would bring the total to 60-80% mortality.

PROPOSED PROJECT

Project Statement

In 1985, the West Virginia Department of Agriculture (WVDA) in cooperation with the USFS, proposes to use Diflubenzuron (Dimilin 25W) on 55,000 acres of private forest land in Morgan, Hampshire and Mineral Counties. Of this total, approximately 5,000 acres of State Park land will be treated in Morgan County.

A single application of Dimilin applied by fixed wing aircraft at the rate of .03 pounds active ingredient (2 ounces Dimilin 25W) in 1.0 gallons water, total volume per acre. The selection of Dimilin was made because it is currently registered for use on uninhabited or sparsely inhabited forest land (less than 64 houses/sq. mile), and dimilin has been shown to be a very effective and selective chitin inhibitor. Parasitic flies, wasps and other predators such as beetles are not affected by dimilin nor are honey bees. The low cost of Dimilin is also a factor which places it on high priority as compared to other comparable insecticides.

Organization

The lead agency for all insect pest management in West Virginia is the West Virginia Department of Agriculture, Gus R. Douglass, Commissioner. The gypsy moth program is under the Plant Pest Control Division headed by Albert E. Cole, Director, and supervised by Alan R. Miller, who is responsible for the Cooperative Forest Pest Action Program. The West Virginia Department of Natural Resources Forestry Division, and county agents, act as a liaison between the general public and the WVDA by dispensing literature and information. The Forestry Division is called upon to assist in the treatment program.

Authority for gypsy moth suppression activities is granted to the Commissioner of Agriculture by the Plant Pest Act of March 9, 1967, as amended.

The West Virginia Department of Agriculture will cooperate with other state agencies who manage or are responsible for forested areas of parks, county governments, local governments, or with private industries or individuals in gypsy moth suppression activities to the extent that funds are made available by the West Virginia Legislature and to the extent that the cooperating agency agrees to these guidelines and procedures. In 1985, the WVDA will protect only forested uninhabited, forested residential and public recreation areas that meet the guidelines set forth in our policy statement objectives.

The primary objective of the suppression project is foliage protection. The second objective is to reduce gypsy moth populations so that natural spread will be reduced and retreatment will not be necessary for at least two years. We expect to achieve foliage protection to at least 80% of the trees and reduce gypsy moth populations by 80-90%.

The objectives to be met depend upon the time of application, size of initial population, the quality and quantity of foliage present and the amount and types of natural controls available. In order to measure the objectives, we will conduct post-spray defoliation surveys, larval-pupal counts and egg mass counts.

Biological Monitoring

The WVDA will use three methods to monitor the results at all treatment sites.

1. The first method will be to count surviving larvae and pupae using burlap bands for detection. Larvae and pupae will be collected and counted from burlap bands on a daily basis. These larvae and pupae will be examined for effects of treatment and will be checked for parasites and disease in the populations.

2. The second method will be to monitor defoliation. This will be done by aerial survey in mid-June, late June, and first of July to detect defoliation. Results will be recorded on $7\frac{1}{2}$ minute topographic maps. Defoliation estimates will be divided into three categories: light defoliation (1-33%), moderate defoliation (34-66%), and heavy defoliation (67-100%).

3. The third method will be to survey the area for egg masses and determine population reduction or increase. Variable and fixed area plots, and 5 minute walks will be made to measure egg mass counts per acre. Results will be compared to pretreatment counts on the same area and compared with control plots.

Treatment Area (Locations)

The proposed project will take place on 55,000 acres of forest land in the counties of Morgan, Hampshire and Mineral. The areas can be divided into distinct blocks: Morgan County (Top of Cacapon Mountain from the Potomac River south to the West Virginia-Virginia State line and east to Route 522). (An area south and east of Berkeley Springs to base of Sleepy Creek Mountain). Sideling Mountain from the Potomac River to the end of this range in Hampshire County. (Total acreage 30,200 acres).

Hampshire County - An area east and south of Green Springs and Town Hill Mountain, south to the community of Levels. (6,440 acres).

Mineral County - The Knobley Mountain area from Ridgely south to O'Neil gap just northeast of Keyser, West Virginia; Green Mountain, an area west and south of Keyser, from the Potomac River at Piedmont south to Route 42 (Total acreage 17,860).

Treatment Area (Selection criteria)

The areas were selected on the basis of egg mass density per acre. The West Virginia Department of Agriculture policy statement considers areas having a minimum of 250 viable egg masses per acre as suitable for treating. The areas selected have egg mass densities as follows: Morgan County 250-2440 egg masses per acre. Hampshire County 250-631 egg masses per acre and Mineral County 250-960 egg masses per acre.

The WVDA policy also sets forth the following priorities, which are as follows: 1. Forested residential, 2. Forested special-use, such as parks, scenic areas and camping areas, 3. the areas must also have forest tree species that are susceptible to gypsy moth damage and have crown cover of at least 50% and be unsuitable for treatment with ground equipment.

Treatment Selection

Treatment Type - The treatment to be used is the chitin inhibitor, Diflubenzuron, 25W on 55,000 acres in the counties of Morgan, Hampshire and Mineral. The acreages are as follows: Morgan-30,200 acres, Hampshire-6,440 acres, Mineral-17,800 acres. The rate of application will be one application of two ounces (.03 lb active ingredient/acre) of 25 WP in total volume of water at one gallon per acre.

Selection Criteria - The criteria used to select Dimilin was based upon the chitin inhibitor being pretty much host specific in that it affects primarily lepidopterous species. It has little, if any, effect on parasites, predators, animals, honey bees, fish, birds and other forms of wildlife. Dimilin has been shown to have an affect on crustaceans when used in high dosages. However, with the 2 oz. per acre application rate, no detrimental effects were observed. Also, the label on Dimilin allows use on uninhabited or sparsely uninhabited forest land containing up to 64 houses per square mile. The amount applied for effective reduction of gypsy moth populations is very low (2 ounces per acre) and the cost is low compared to other currently registered chemicals. It has been shown that Dimilin has the capability of reducing populations by 90-100%. This has been shown in the West Virginia treatments of 1979 and 1984.

The Dimilin in all cases will be applied where egg mass densities are high and generally sparsely inhabited.

Another major factor in selecting Dimilin over other currently registered chemicals is the abundance of active fruit orchards in the area. Dimilin has been shown to have no effect on honey bees in adult stage or in brood chamber. The competitive comparison of biological efficiency, environmental effects and economic feasibility are of major concern when selecting Dimilin for use.

Method of Treatment

Dimilin will be applied aerially by either fixed-wing or rotary-wing aircraft capable of meeting the needs of the project. There will be only one contract awarded to apply the material.

Contractors must meet the following requirements: aircraft must meet FAA guidelines for operating in the areas involved; the contractor must be

a pesticide applicator firm, licensed by the State of West Virginia; and pilots must be certified and licensed for the aircraft they are operating.

Calibration of aircraft will be performed by WVDA personnel prior to the start of operations, and will be periodically rechecked during application. A WVDA employee will be designated as officer-in-charge and will be present at the loading site to control the project and monitor contractor compliance.

It is anticipated the treatment will begin on or about May 13. Actual treatment dates will depend upon development of host trees foliage and gypsy moth larvae.

Safety Considerations

A detailed safety plan will be part of the Project Work Plan and will be developed prior to the start of the project. The safety plan will address but will not be limited to discussion of the following:

Contractor responsibilities, safety during storage, mixing and loading of insecticides, maintaining aircraft in top operating condition and inspections of aircraft. Qualifications of pilots and mechanics will be checked.

State responsibilities for monitoring compliance for safe use of pesticides and equipment.

State responsibilities for saft working conditions for all project employees.

Benefit/Cost Analysis

The benefit/cost ratio will vary from site to site depinding upon the value of the site being treated. This value could be very high in residential forested areas versus non-residential forested areas. The value on residential forested areas is very difficult to calculate due to different preferences and opinions on the value of forested home sites. Therefore, the benefit/cost ratio is computed on value of timber or pulpwood species of trees. The Eastern Panhandle, where we propose a treatment, has a stocking of 60-100% oak. In the actual treatment areas the component of oak is 80% We have had a looper complex in the general area for three years and are currently experiencing, after two years of defoliation, a 21% mortality to sawtimber and 13% mortality to pulpwood stands. Based on stumpage value of \$65.00 per MBF of sawtimber and \$3.00 per cord for pulpwood, the total loss per acre would be \$117.77. The estimates are probably very low because quality red oak has been bringing \$150.00 per MBF on the stump and cord wood has been retailing at \$100.00 per cord as firewood. If, however, we use the figure of \$65.00 per MBF for sawtimber and loss at \$102.92/acre (21%), we can see that an acre of forested land containing sawtimber is worth (\$102.92 X 5) \$514.60. We anticipate the treatment will cost \$15.00/acre or \$869,875.00 for the 51,325 acres. The computed loss of sawtimber at \$102.92 per acre would be \$5,282,369.00 for 51,325 acres. The losses by gypsy moth in the northeast have amounted to 40-80% of the oaks. In West Virginia an 80% loss would be catastrophic.

Scoping Activities

In the past, our scoping activities have been public meetings to address the issues and concerns about proposed project. This year (due to past experience with inclement weather and having a small turnout) we sent letters to 105 individuals, organizations and agencies asking that they respond with their issues or concerns. None were received.

Since no comments were received, we held two public meetings and presented our plans for treatment. The first meeting held March 27th at Keyser, West Virginia discussed the Mineral, Hampshire county area. Approximately 28 persons attended and no new issues or concerns were brought forth. The second meeting was held March 28th at Cacapon State Park and the Morgan, Hampshire county areas were discussed. Approximately 50 persons attended this meeting and no new issues or concerns were brought forth. The major concern at the meeting was that individuals present were not included in the treatment area.

Several letters were received by residents in the area supporting the proposed treatment.

AFFECTED ENVIRONMENT

Host vegetation

The areas selected for treatment are heavily forested areas with small fields, occasional orchards and some small farm ponds situated throughout.

The major vegetation is oaks (80%), with intermingling of pine, maple, sycamore, black locust, white ash, dogwood, hawthorn, laurel, hickory, yellow poplar and other miscellaneous species. The oaks are specifically white oak, chestnut oak, red oak, yellow oak, and scarlet oak. The majority of the oaks are found throughout the areas and the only exceptions would be along streams and in moist coves.

Potential Treatment Sites (Human population distribution)

The Mineral County area contains two areas that are to be treated. Both are forested sparsely inhabited. The green Mountain area in Mineral County contains 11,050 acres and has an estimated population of 100 persons or .009 persons per acre. The Knobly Mountain area is more populated, contains 6,810 acres for treatment and a population of approximately 1,000 persons or .14 persons per acre.

The Hampshire County area contains 6,440 acres with an estimated 100 persons in the area or .015 persons per acre.

The Sideling Mountain area in Morgan County contains 6,820 acres and an estimated 50 persons in the area or .007 persons per acre.

The Cacapon Mountain area in Morgan County contains 14,020 acres and an estimated 1,000 persons in the area or .07 persons per acre. The remainder of Morgan County contains 16,180 acres with an estimated population of 2,000 persons or .12 persons per acre.

The overall average persons per acre in total treatment area is .07. persons per acre.

In all areas proposed for treatment there are no small towns.

The Cacapon Mountain area is a recreation area and could possibly have a high number of persons in the area during the peak vacation season. It is possible that many persons could be in the park on the week-ends. However, the park proper or recreational area will not be treated on week-ends or holidays. The treatment of these areas will be done in mid-week early in the morning when activity is minimal.

The town of Berkeley Springs is near the treatment area but will not be treated.

Nontarget Organisms

The non target organisms in all areas include humans and other mammals, birds, reptiles, amphibians, fish and other invertebrates. Letters were sent to agencies, organizations and individuals requesting information on the treatment area. No concerns (rare or endangered species) were identified. If rare and endangered species are present, the material Dimilin would have little, if any, effect on such species when applied at the two ounces 25% WP per acre. The special annual list of the Natural Heritage Program has been reviewed and no endangered species were noted that would occur in the treatment area.

Geography

The area where treatment is to take place is known as the Potomac River Basin or geologically as the Ridge and Valley Province. The valleys are wide and fertile and the entire region has a climate and appearance differing widely from the mountainous area to the west. The Green Mountain area which is proposed for treatment is known as Allegheny Front and differs from the Potomac River Basin.

In Mineral County, two areas are proposed for treatment and are as follows: Green Mountain-This area is known as the Allegheny Front and the elevation varies from 2,200' at the northern end and 3,000 feet elevation at the southern end. The area is approximately eleven miles long and two miles wide. This area will have leaf development and insect hatch at different dates than the easternmost area. Therefore it will be the last area to be treated. (Late May), No major streams or impoundments are present.

The other area in Mineral County is known as Knobley Mountain. It extends some 15 miles in length and varies from 3/4 of a mile to 1 3/4 miles wide. The elevation ranges from 900 feet on the east slope to 2,000' on top and 700' on the west slope. The area extends from Ridgely, West Virginia south to O'Neils gap just northeast of Keyser, WV. No major stream or impoundments are present.

In Hampshire County the area is known as Town Hill Mountain and is 7½ miles long and ½ mile wide. The elevation ranges from 1,000' on the east and west slopes to 1,300' at the top of the ridge. An area adjoining this ridge is along the Potomac River and the elevation here ranges from 600' to 1,000'. The major tributary in this area is the South Branch of the Potomac and will not be treated. No other major streams or impoundments are in this area.

In Morgan County the areas are as follows: Sideling Mountain-The block is 12 miles long and 1 mile wide. The elevation ranges from 1,300' on the east slope to 1,880' on the top with a 1,000' elevation on the west slope. No major streams or impoundments are in the area. Cacapon Mountain-The area is 12 miles long and approximately 1 ¾ miles wide. The elevation ranges from 800' on the east slope to 2,200' on top of the mountain. The western slope will not be treated but drops off to a 500' elevation. The area east of Cacapon Mountain lies in the valley and elevation ranges from 600' to 1,000'. The Cacapon Mountain and Valley areas have small streams and impoundments. All precautions will be taken and buffer zones of 200' applied where necessary. Two impoundments of some size are in Cacapon State Park and Coolfont recreation areas. Both will be marked and avoided when treating.

ENVIRONMENTAL CONSEQUENCES

Environmental Effects

Beneficial Effects - The use of Dimilin, properly applied, in these proposed areas will accomplish the objective of foliage protection and gypsy moth population reduction. By providing foliage protection there is less stress on the trees which can ultimately lead to less mortality. Protection of foliage is also essential to wildlife habitats and other species of plant life. Protection of foliage also enhances the mast crop which is essential to certain species of wildlife that are in the proposed area. These would include turkey, deer, grouse, squirrel and an occasional bear. The reduction of gypsy moth caterpillars will enhance the recreation areas in treatment area by a reduction of invading caterpillars in and around cabins, picnic shelters and camping areas. In 1981-82 this same area was invaded by loopers and persons visiting the Cacapon Mountain area checked into cabins, saw the small caterpillars and requested refunds and left the recreation areas. This would certainly be repeated in 1985 if the area were not treated. The reduction of gypsy moth populations also provides several years of relief before these populations are again at high numbers. The "no action taken" is documented in the 1985 Environmental Impact Statement, pages 31-35.

Adverse Effects

The adverse effects in these areas from the use of Dimilin are not expected to cause any concern. The proper use of aircraft, correct amount of material and continual monitoring of application should reduce any chances of detrimental effects. The proper rate of material applied will not adversely effect any threatened or endangered species or their habitats. By continual monitoring of application, the chance of misapplication to non target organisms is reduced. However, other lepidoptera larvae that are

feeding on treated material during this time frame will be affected. Generally, the only other lepidoptera that are feeding during this period of time are forest tree species which may cause defoliation to trees. Small impoundments within the treated areas will have a buffer zone of 200' around the edge. This will minimize the adverse effects upon aquatic organisms.

Minor adverse effects could be listed as low flying aircraft, noise from aircraft and droplets of spray deposited on outdoor surfaces. The noise from aircraft may awaken many persons in early morning, but all should be made aware by news releases, radio announcements, etc., that the operation is taking place.

Irreversible or Irretrievable Commitment of Resources

The resources committed to this suppression project include the majority of Plant Pest Control personnel and a small number of Service Foresters. Other programs are affected during the period of treatment because many of the personnel are in charge of other programs. The persons controlling the allocation of these resources must consider the project to be worth the price and manpower spent on the project.

Another irreversible resource is the loss of trees that may occur if treatment does not take place. Studies in West Virginia show that after two (2) years of defoliation we can expect to lose 30% of the oaks. Trees in the former defoliated areas are still dying and mortality is certainly much higher than 30%.

Human Health

As stated earlier, Dimilin has little, if any, effect on human populations. The Final Environmental Impact Statement as Supplemented - 1985 (FEIS) documents the human health issues related to the use of insecticides including Dimilin, which is an insect growth regulator. This information can be found on pages F-97 through F-101 and on page F-72 of the FEIS. Also, information relating to human exposure can be found on pages F-26 through F-51 of the FEIS. As stated in the FEIS, diflubenzuron, the active ingredient in Dimilin, is classified by the EPA as having no evidence of carcinogenicity in humans.

The table 10 on page F-125 relates to the expected doses to established exposure thresholds for Dimilin (diflubenzuron). In this scenario, the rates are based on 0.06 lb ai/acre. The treatment in West Virginia will use .03 lb/acre of active ingredient, resulting in expected exposure doses far in excess of the established Acceptable Daily Intake values. This results in an expected exposure dose far in excess of the established Acceptable Daily Intake (ADI) values.

Also, we plan to treat sensitive areas such as Cacapon State Park and Coolfont recreation area during mid week when human population is at a minimum.

The label requirement of less than 1 dwelling per 10 acres will be adhered to in establishing areas to be treated.

ADMINISTRATIVE REQUIREMENTS AND CONSTRAINTS

Guidelines for Local Participation

In West Virginia at the present time there will be no cooperative

suppression program with counties. Except, however, the county officials will be notified that an infestation exists and that a program will be initiated if county governments, residents and property owners concur. During 1985, all costs will be absorbed by the West Virginia Department of Agriculture.

Public Involvement

Public involvement in the planning process is the responsibility of the West Virginia Department of Agriculture and will be initiated through public meetings and scoping activities to be held in the counties where private lands will be treated. Local input is necessary to identify sensitive areas and objectors living adjacent to and within the proposed treatment area. Such input will be used to finalize treatment block design and buffer zones. Notification will be by news media and not individual letters to landowners.

Public Notification

Public notification is the primary responsibility of the West Virginia Department of Agriculture with assistance from local groups. The notification process is accomplished as follows:

1. Local newspaper, radio and television stations, and public meetings will be held by representatives of Plant Pest Control Division.
2. Additionally, county extension agents and farmer groups will be assisting in disseminating information regarding treatment.
3. Final stages of notification will begin approximately thirty (30) days before application date. Then, next notification will be one week before application date.
4. At the time of treatment daily notification will be made through the press and radio media.
5. A Division information officer will be available to receive calls from the public during all operational hours.
6. The West Virginia Department of Agriculture will coordinate with local county governments, law enforcement, cooperative extension service, and the West Virginia Department of Natural Resources.
7. Maps of treatment area will be posted in local courthouses and county agents offices.

Precautionary Measures and Constraints

The precautionary measures and constraints that the West Virginia Department of Agriculture will employ are similar to those followed by the States of Maryland, New Jersey, Pennsylvania, as described in the 1984 and 1985 site specific. A brief synopsis follows:

ENVIRONMENTAL ASSESSMENT

Application Constraints

Aerial treatments will not commence or will be terminated if:

- a. Wind is greater than 10 mph.
- b. Temperatures are above 83°F.
- c. Foliage is wet and dripping.
- d. Rain is predicted within 1 hour.
- e. Thermal inversions are present.
- f. Leaf development is less than 50%.
- g. Egg hatch is less than 50%.
- h. Abnormal fog conditions exist.

Treatments will be confined to daylight hours commencing at dawn. Late afternoon - early evening spraying will be considered when conditions permit.

Radio communications will be maintained between:

1. Pilot and chase plane.
2. Pilot and loading site.
3. Field crews and chase plane.
4. Chase plane and loading site.

Prior to application, the contractor (pilots) will be briefed on the spray blocks and provided with USGS 7½ minute series topographic maps. Spray blocks will be marked from the ground with balloons and kytoons.

Environmental Constraints

The chitin inhibitor, Dimilin, will be applied to forested (uninhabited or sparsely inhabited - 1 house per 10 acres) land. It will not be applied to bodies of water, including farm ponds, lakes, major streams and rivers. Buffer zones of 200' will be maintained around water, objectors, etc.

The areas to be excluded will be marked, if necessary, by helium filled balloons for pilots to see and guided, where necessary, by chase or observation planes. Topographic maps will be provided to pilots and all sensitive areas marked or delineated.

Human Health

Standard pesticide mixing and loading procedures, precautions and label directions will be followed to minimize exposure to project personnel at aircraft loading site.

An analysis of human health risks associated with the use of Dimilin has been conducted in the USDA final EIS (Appendix F). The results of that analysis identify human health risks from using Dimilin in gypsy moth projects that are uninhabited or sparsely inhabited. See Table 10 of EIS page F-125 or F 129. From the information the risks associated with Dimilin are minimal and practically nonexistent.

PERFORMANCE MONITORING

Application Monitoring

West Virginia Department of Agriculture personnel will make decisions to treat or not to treat. Contractor may make decision not to treat due to inoperative equipment, poor visibility, or other logical constraints.

Mixing and loading of the aircraft will be monitored by WVDA staff.

The amount and size of spray droplets will be monitored by using deposit cards. These cards will be placed in treatment areas to monitor droplet size, droplet distribution, drift and application to non-target areas. Droplet size will be 100-150 microns in size and 20 drops per centimeter.

WVDA personnel will oversee all activities in treatment program and contractor never works without state personnel acting as supervisors, overseers and block markers.

A chase plane will be used to make sure the application is on target and spray material is not rising due to thermal conditions.

Environmental Monitoring

Monitoring of target pest development, application of insecticides and effectiveness of the insecticide will be conducted during the suppression program.

Pesticide use and enforcement staff will monitor all applications of pesticides, pesticide container disposal and general pesticide use and label compliances.

All complaints by landowners or residents will be investigated and dealt with.

Observations are made in area after treatment to see if larvae are being killed. Later in the fall an egg mass survey is conducted on a systematic basis to see if populations were reduced.

In the event of an insecticide spill in water, the West Virginia Department of Agriculture, in cooperation with other state agencies, will sample water and observe the site for incidence of adverse effects.

Authority

The responsible state official for the proposed action is Albert E. Cole, Director, Plant Pest Control Division, West Virginia Department of Agriculture. The gypsy moth project will be supervised by Alan R. Miller.

Further information regarding the proposed 1985 project may be obtained by contacting Mr. Miller at the West Virginia Department of Agriculture, Plant Pest Control Division, State Capitol Complex, Charleston, West Virginia 25305.



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6